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ABSTRACT

The Myers-Briggs Type Indicator is a Jungian-oriented self-report inventory which classifies people into dichotomous categories along four scales: extraversion-introversion, sensation-intuition, thinking-feeling, and judgment-perception. Introduced in 1942, the scoring and items have changed after several items analyses. Form F contains 51 phrase questions and 44 word pairs. A critical review of reliability and validity studies raises four issues to consider when evaluating the Indicator: (1) correspondence between Jung and Myers typology; (2) adherence to Myers' typology; (3) predictive validity; and (4) uniqueness. Myers has a different concept of the extroversion-introversion and judging-perceiving scales, but the scales do not reflect this concept. The Indicator generally does not reflect Myers' typology; classifications do not appear unchanging, interacting, or associated with different compounds of surface traits; in addition, type indeterminacy is unrelated to ineffective behavior and maladjustment. The Indicator may be useful for grade prediction in liberal arts schools, but its ability to identify vocational interest and creativity is limited. Finally, only the thinking-feeling scale is unique among existing scales; but factor analysis may uncover other unique properties. Norms are presented for high school, college, and graduate students; recently employed college graduates; and public school teachers. (CP)

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A DESCRIPTION AND EVALUATION
OF THE
MYERS-BRIGGS TYPE INDICATOR

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A DESCRIPTION AND EVALUATION OF THE MYERS-BRIGGS TYPE INDICATOR

Errata

Page 21, the 19th line, the first phrase should read ".63 for E-I."

Page 25, the first sentence should read "One of the Indicator correlations with the criteria was significant for Cal. Tech.--the J-P scale correlated .14 with over-under achievement."

Page 33, the second paragraph should read "On the EPPS, the E-I scale correlated positively with the Exh, Aff, Dom, and Chg scales and negatively with the Ach, Def, and Aba scales. The S-N scale correlated positively with the Def and Ord scales and negatively with the Ach and Aut scales. The T-F scale correlated positively with the Ach, Ord, Aut, Dom, Chg, and End scales, and negatively with the Aff, Suc, Aba, Nur, and Het scales. The J-P scale correlated positively with the Def, Ord, and End scales and negatively with the Exh, Aut, Chg, Het, and Agg scales."

Page 34, the first line, the first phrase should read "Mf, Ma, and Pt."

Page 51, the second sentence should read "There were only four significant ($p < .05$) correlations with the clinical scales, which might be expected by chance because of the large number of significance tests (80) applied to the Indicator-clinical scale correlations."

Page 51, the fifth sentence should read "In addition, the K scale correlated positively with the dichotomous indeterminacy measure and the F scale correlated positively with the continuous indeterminacy measure."

Page 91, Table 6, the entry for the phi coefficient between T-F and J-P for the male high school students should be ".13g*".

Page 94, Table 8, a corrected copy of the second section of this table is attached.

Page 103, Table 16, the entry for the phi coefficient between the Indicator and the Gray-Wheelwright E-I scales should be ".63**".

Page 108, Table 21, the entry for the correlation between the J-P scale and over-under achievement at Cal. Tech. should be ".14*".

Page 113, Table 25, the entry for the proportion remaining of clerical employees in the S type classification should be ".53".

Page 127, Table 33, the entry for the correlation between the S-N scale and the Het scale should be "-.06".

Page 135, Table 37, the χ^2 entry for the difference in S-N type classifications between the College Prep. Boys and the General-Vocational Boys should be "52.02**".

Page 148, Table 49, the F entry for the T-F scale in the male arithmetic reasoning test regression should be "1.75".

Page 151, Table 52, the entry for the difference between the correlations with GPA for the J and P students should be ".21".

Page 157, Table 55, the entry for the correlation between the T-F continuous indeterminacy measure and Hy should be ".13*" and the entry for the correlation between the J-P continuous indeterminacy measure and F should be ".13*".

Corrected Copy

Table 8 (Continued)

Scale	Factor I	Factor II	Factor III	Factor IV
Study of Values:				
Theoretical				
(1)	-.05	-.20	.37	.12
(2)	-.06	-.25	.37	.13
Economic				
(1)	.11	.42	.13	-.03
(2)	.15	.43	.19	-.02
Aesthetic				
(1)	-.22	-.30	-.03	-.09
(2)	-.19	-.33	-.01	-.04
Social				
(1)	.11	.09	-.30	.01
(2)	-.06	.05	-.33	-.01
Political				
(1)	.06	.08	.22	-.10
(2)	.26	.23	.08	-.14
Religious				
(1)	.01	-.07	-.29	.07
(2)	-.08	-.10	-.28	.09

[a] Factor loadings have been reflected so that factors have positive loadings on the Indicator scales that they define.

A DESCRIPTION AND EVALUATION OF
THE MYERS-BRIGGS TYPE INDICATOR

The Myers-Briggs Type Indicator, which is based on a conceptual scheme modeled after Jungian typology (Jacobi, 1951; Jung, 1923; Jung, 1933; Jung, 1953), classifies people, on the basis of their self-reported behavior, preferences, and value judgments, into dichotomous categories along each of four interlocking dimensions: extraversion-introversion, sensation-intuition, thinking-feeling, and judgment-perception.[1]

The first version of the Indicator was developed in 1942 by Mrs. Katharine C. Briggs and Mrs. Isabel Briggs Myers who have since conducted extensive item analyses and other research aimed at improving the Indicator and assessing its validity. This research has been reviewed by Stricker (in preparation). Since 1956, investigators at Educational Testing Service and throughout the country have used recent versions of the Indicator in a variety of reliability, validity, and normative studies.[2]

This paper, which is a critical evaluation of the Indicator, describes the theory which underlies it, the way that the Indicator was constructed, and all known studies involving the current version (Form F) which seem to employ an adequate research design and statistical analysis and were available by the Spring of 1961. Important studies which meet these criteria but which employed earlier versions of the Indicator are also described.[3] Most of the research findings are based on heretofore unpublished studies by the authors of this paper. In addition, relevant published and unpublished studies by other investigators are also reviewed in detail.

Theory

The Four Dimensions

Extraversion-introversion and the four functions (i.e., sensation, intuition, thinking, and feeling) are concepts formulated by Jung and adapted by Myers. In addition, Myers adds a judging-perceiving dimension which is based on a distinction that Jung makes among the four functions.

Rather than being independent, these four dimensions interlock in the sense that extraversion-introversion indicates the focus of cognitive activity, judging-perceiving describes its predominant nature, and the four functions involve its specific varieties.

Extraversion-Introversion (E-I). Myers[4] defines extraversion-introversion in the following way:

> The introvert's main interests are in the inner world of concepts and ideas, while the extravert's main interests are in the outer world of people and things. Therefore, when circumstances permit, the introvert directs both perception and judgment upon ideas, while the extravert likes to direct both upon his outside environment . . . .

For Jung,

> [Extraversion is] a positive movement of subjective interest towards the object. Everyone in the state of extraversion thinks, feels, and acts in relation to the object,

> and moreover in a direct and clearly observable fashion, so that no doubt can exist about his positive dependence upon the object. In a sense, therefore, extraversion is an outgoing transference of interest from the subject to the object . . . . The state of extraversion means a strong, if not exclusive, determination by the object (Jung, 1923, pp. 542-543).
>
> [Introversion is] a negative relation of subject to object . . . . Interest does not move towards the object, but recedes towards the subject. Everyone whose attitude is introverted thinks, feels, and acts in a way that clearly demonstrates that the subject is the chief factor of motivation while the object at most receives only secondary value (Jung, 1923, p. 567).

Judging-Perceiving (J-P). Myers argues that a great part of *overt* cognitive activity can be regarded as either judging (coming to a conclusion about something) or perceiving (becoming aware of something):

> There is a fundamental difference between the two attitudes. In the judging attitude, in order to come to a conclusion we have to shut off perception for the time being. The evidence is all in. Anything more is incompetent, irrelevant and immaterial. We will now arrive at a verdict and get things settled. Conversely, in the perceptive attitude we shut off judgment for the time being. The evidence is not all in. There is much more to it than this. New developments will occur. It is much too soon to do anything irrevocable.

No separate and explicit variable of this kind is found in Jung's typology, but Jung does classify each of the four functions as either rational (or judging) or irrational (or perceiving). This destinction among the four functions is paralleled by Myers' classification of them as either judging or perceiving. Thinking and feeling are considered as rational or judging; sensing and intuition are considered as irrational or perceiving. Jung defines rational (or judging) as a tendency ". . . to shape thought, feeling, and action in accordance with objective values . . . established by the average experience of external . . . and . . . inner psychological facts . . ." (Jung, 1923, p. 583) and irrational (or perception) as a tendency to ". . . aim at pure perception . . . to reach the most complete perception of the whole course of events" (Jung, 1923, p. 584).

Sensation-Intuition (S-N)[5]. Like Jung, Myers postulates two ways of judging and two ways of perceiving. The two distinct ways of perceiving postulated are sensation and intuition. Myers defines them as follows:

> There is not only the familiar process of sensing, by which we become aware of things directly through our five senses. There is also the process of intuition, which is indirect perception by way of the unconscious, accompanied by ideas or associations which the unconscious tacks on to the perceptions coming from outside. These unconscious contributions range from the merest masculine "hunch" or "woman's intuition" to the crowning examples of creative art or scientific discovery.

> . . . When people prefer sensing, they find too much of interest in the actuality around them to spend much energy listening for ideas out of nowhere. When people prefer intuition, they are too much interested in all the possibilities that occur to them to give a whole lot of notice to the actualities.

Jung defines sensation-intuition in the following way:

> Sensation, or sensing, is that psychological function which transmits a physical stimulus to perception . . . . Sensation must be strictly distinguished from feeling . . . . Sensation is related not only to the outer stimuli, but also to the inner, i.e., to changes in the internal organs (Jung, 1923, pp. 585-586).
>
> [Intuition] is that psychological function which transmits perceptions _in an unconscious way_. Everything, whether outer or inner objects or their associations, can be the object of this perception. . . . Through intuition any one content is presented as a complete whole, without our being able to explain or discover in what way this content has been arrived at . . . (Jung, 1923, pp. 567-568).

Thinking-Feeling (T-F). Two distinct and contrasting means of judging postulated by both Myers and Jung are thinking and feeling. For Myers,

> . . . _thinking_ . . . is a logical process, aimed at an impersonal finding . . . . _feeling_ . . . is a process of appreciation . . . bestowing on things a personal, subjective value.

> . . . If, when you judge these ideas, you concentrate on whether or not they are true, that is thinking-judgment. If you are conscious first of like or dislike, of whether they are sympathetic or antagonistic to other ideas you prize, that is feeling-judgment.

For Jung,

> Thinking is that psychological function which . . . brings given presentations into conceptual connection . . . . [It is] the linking up of representations by means of a concept, where . . . an act of judgment prevails . . . (Jung, 1923, p. 611).

> Feeling is . . . a process . . . that imparts to the content a definite value in the sense of acceptance or rejection ('like' or 'dislike') . . . (Jung, 1923, p. 543).

Leading and Auxiliary Function

Following Jung, Myers conceives of one of the four functions as being more developed and hence more influential than the others. This leading function is complemented by an auxiliary function. It is the stronger function in the other of the two pairs of functions. (If the leading function is one of the perception pair, the auxiliary function is the stronger of the two judging functions; if the leading function is one of the judgment pair, the auxiliary function is the stronger of the two perceiving functions.) Unlike Jung, Myers asserts that the leading and auxiliary functions operate differently for extraverts and introverts; the leading function is seen in extraverts' behavior and the auxiliary function is seen in introverts' behavior. Since Myers conceives of the judging-perceiving dimension as reflecting the nature of the function prevalent in overt behavior, this dimension indicates the leading function of extraverts (e.g., the leading function of an ENTJ person is T) and the auxiliary function of introverts (e.g., the auxiliary function of an INTJ person is T and his leading function is N).

Development

Both Jung and Myers conceptualize these variables as representing the outgrowth of different directions of development. Although the direction of development may be inborn, the extent of the development depends upon the environment, which may allow these predispositions to operate or, on the other hand, hinder their operation. In the latter case, characteristics inconsistent with the original predisposition develop which, in turn, result in conflict and maladjustment.

While an individual may engage in opposing kinds of behavior (e.g., sensation and intuition, or thinking and feeling), his predisposition results in more reliance on and increased effectiveness with one of these processes. The resulting reliance on a particular process determines the pattern of personality characteristics, values, interests, and other surface traits which develop.

In some people, however, the opposing attitudes (e.g., extraversion and introversion) or functions (e.g., sensation and intuition) are at the same level, which only occurs, according to Jung, when both are undeveloped, rather than being equally developed. Myers indicates that the outcome of this type "indeterminacy" is conflicting, vacillating, and, consequently, ineffective behavior.

Jung and Myers agree on the categorical and interacting nature of the dimensions. Although the extent to which a person's type is actually developed may be a continuous variable, type, per se--the direction of the development--is categorical. A person is an extravert or an introvert, sensing or intuiting, thinking or feeling, judging or perceiving. Moreover, these four dimensions both interlock and interact (e.g., extraverted thinking is qualitatively different from introverted thinking, and an INTJ is considerably different from an ENTJ).

Several features of Jung's typology which are not found in Myers' are these:

(a) The goal of development is to bring all four functions to consciousness (the most differentiated attitude and the leading function are completely conscious, the auxiliary function is relatively unconscious, and the other functions are largely unconscious). Myers virtually ignores unconscious phenomena.

(b) The opposing functions and attitudes stand in compensatory relationships, even in their unconscious state; an unconscious counterpart for every conscious attitude and function develops in an undifferentiated form as its counterpart develops (e.g., an ENT person develops ISF unconsciously).

(c) A transcendent function may operate to minimize differences and bring about a balance of attitudes and functions within the self.

Construction of the Indicator

Nature of Items[6]

Items for scales to measure each of the four postulated dimensions were prepared on the basis of theoretical considerations and impressionistic observations of apparent differences between people of different types. The early items described typical behavior or value judgments (e.g., Do you think it is a worse fault (a) to show too much warmth? (b) not to have enough warmth?). Later, word pair items were added--the subject indicated which word in each pair appealed most to him (e.g., congenial--effective). All items involved at least two alternatives; one alternative reflected a particular attitude or function, and the other alternative reflected the opposite attitude or function. An attempt was made to make both alternatives equally desirable in the special sense that the extravert alternative to an item, for example, was as attractive to subjects classified as extraverts as the introvert alternative was attractive to subjects classified as introverts.

Item Selection and Weighting

As the summary in Table 1 of the item analyses carried out between 1943 and 1959 indicates, the original items were orally administered to a small group of subjects and those items retained which agreed with the type classifications of these subjects made by the test authors. In subsequent internal consistency item analyses, changes were made in existing items, new items were added, and items which were found to be related to total scale classification on the relevant dimension but unrelated to the other dimensions were retained. Total scale classification in the first item analysis was based on the key derived from the criterion group analysis and in later item analyses was based on the key derived from the preceding internal-consistency item analysis.

Insert Table 1 about here

Each alternative was weighted separately (a) to reflect the extent of the alternative's relation to the scale classification, as determined from the item analyses, and (b) to set the scale's zero point. Myers asserts that the zero point of the scale (i.e., where the scores for the two opposing attitudes or functions are equal) has real meaning; a person who is one point above this zero point is quite different from a person who is one point below this zero point.

Myers reports that the zero points for the early forms (Forms A to D) were identified by rescoring with the new keys the original answer sheets of the group whose types had been classified by the test authors and comparing these new scores with the empirical type classifications.

The zero points for the Form D2 S-N, T-F, and J-P scales were identified by bimodality in the distribution of scale scores--the zero point being that point which separated the two distributions. Myers reports that such bimodality was found in the distribution of scores on the entire S-N and J-P scales for 704 Dartmouth students (Class of 1961) and 711 Cal. Tech. students (Classes of 1958-1962), and in the distribution of scores on a scale composed of T-F word pair items for 170 Lexington VA Hospital mental patients. The existing and theoretical zero points seemed to coincide for the S-N and T-F scales, but not the J-P scale.

The zero point of the Form D2 E-I scale was identified by discontinuity in the regression of intelligence test scores on the scale scores--the zero point being that point which separated the two regression lines. Myers reports that such a regression was obtained for male and female college preparatory students in 27 Pennsylvania high schools; the existing and theoretical zero points were different.

Whichever procedure for identifying the zero point was used, once its proper location was determined, item weights were modified, if necessary, so that the obtained score distribution corresponded to it.

On the current version of the Indicator, there are separate T-F keys for males and females.

Scoring

The current score on a scale is the difference between the sums of the weights (or scores) for the two kinds of alternatives which were chosen. A person's E score, for example, is the sum of the weights for the extravert alternatives he chose, and similarly, his I score is the sum of the weights for the introvert alternatives he chose. His E-I score is the difference between the E and I scores. The direction of this difference indicates which of the two categories is dominant. For example, if the E score is 4 and the I score is 16, the E-I "difference score" is I 12 and the person would be classified as an introvert. If the two scores were reversed, the person's difference score would be E 12 and the person would be classified as an extravert. If the scores on the two keys for a scale are equal, the person's difference score is X0--the type is considered indeterminate (X).

This is not the usual kind of difference score since the two scores are derived from the same items; the identical score could be obtained by arbitrarily considering one scale category, E for example, positive and the other category negative, using corresponding weights of 2 to -2, and algebraically adding the weights for the chosen alternatives.

Although these scores were expressly derived for use in categorical classifications (e.g., E, X, or I), the scores can be used as estimates of location on a continuum. For this purpose, continuous scores may be derived by arbitrarily considering the E, S, T, and J difference scores as positive and I, N, F, and P difference scores as negative and then algebraically adding a constant, say of 50, to each difference score to eliminate negative numbers. With this procedure, for example, an E 15 score becomes 65 and an I 15 score becomes 35--and all X0 scores become 50. This procedure was followed in all correlational studies described in this paper.

Differences Between Succeeding Versions

The scales derived from the last major item analysis, Form D2, are identical with the current Form E and Form F scales, but there are some differences in non-keyed items which may interact with responses to the keyed items, rendering the scores uncomparable.

These three recent forms differ from the earlier forms in several ways: (a) items--as Table 2 indicates, very few of the keyed items on these recent forms are identical to those on the earlier forms, and not all these items which also appeared on the earlier forms were keyed on those forms; (b) weights for the alternatives--recent forms, in effect, use 2 to -2 weights and early forms used 1 to -1 weights; (c) scoring procedures--recent forms use a difference score and earlier forms used the ratio of the difference score for a scale to the total weights for all chosen alternatives on that scale; and (d) criterion for type indeterminacy--it was somewhat broader for earlier forms.

Insert Table 2 about here

Effect of Differential Item Weighting

To investigate the comparability of scores based on the present alternative weights which, in effect, range from 2 to -2, with scores based on simpler weights, a random sample of 50 Form E answer sheets for male freshmen and 50 answer sheets for female freshmen at Pomona College were scored with the regular weights, -1, 0, 1 weights, and 0, 1 weights (for the latter, E, S, T, and J alternatives had the unit weights). Product moment correlations, for each sex, between the score for each of the four dimensions appear in Table 3. The lowest correlation for either men or women between scores for any variable based on the regular weights was .987 for scores with the -1, 0, 1 weights and .947 for scores with the 0, 1 weights.

Insert Table 3 about here

In addition, the correlation between scores on the male and female T-F keys, using the regular weights, is .994 for men and .995 for women, but the mean scores on the two keys are different. (For men, the male key results are Mean = 1.12 (F), S. D. = 9.33; and the female key results are Mean = 2.98 (T), S. D. = 10.16. For women, the male key results are Mean = 7.46 (F), S. D. = 9.39; and the female key results are Mean = 3.82 (F), S. D. = 10.19.) The use of separate keys reduces sex differences on this dimension. When both men and women are scored with the same key, either the male or female version, their mean scores differ by six points; when men and women are scored with their own key, their mean scores differ by about two points.

Recent Item Analysis Results

The effectiveness of the successive internal-consistency item analyses was examined in a recent item analysis based on 395 boys and 400 girls[7] from 12th grade classes in eight academic and vocational high schools in Massachusetts. E, S, T, and J alternatives were arbitrarily considered "correct" for the keyed items and the first alternative was arbitrarily "correct" for the unkeyed items. Biserial correlations were then computed separately for boys and girls between each item and the continuous scores (which were normalized) for each of the four scales. The median biserial correlations with the appropriate scale scores for the items on the scale and items not on the scale appear in Table 4. (The sign of the correlation was disregarded in computing median correlations of the unkeyed items; none of the items on the scales was negatively correlated with the scale score.) The median correlation of the keyed items with the appropriate scale scores ranged from .43 to .55 and the median correlation of the unkeyed items with scale scores ranged from .07 to .12. The correlations of the keyed item apparently were only slightly inflated because they are contained in the total score against which they are correlated. For the 22 E-I items, there was a median difference of only .09 between the correlation of each item with the total score including the item and its correlation with the total score not including the item, using a random sample of 100 boys from the larger group.

Insert Table 4 about here

Item Composition of the Scales

In the current version of the Indicator, the E-I scale contains 16 phrase questions and 6 word pairs, the S-N scale contains 12 phrase questions and 14 word pairs, the T-F scale contains 7 phrase questions and 16 word pairs, and the J-P scale contains 16 phrase questions and 8 word pairs.

As an illustration of the content of these scales, the two items of each kind from each scale which were most highly correlated with the total score on their scale in the item analysis of Massachusetts high school students are shown in Table 5.

Insert Table 5 about here

Scale Intercorrelations

The relationships between the four scales have been assessed by intercorrelational studies and factor analyses. Correlations were computed for four student groups: 397 male and 614 female high school students and 300 male and 184 female Long Island University students (the entire freshman class).

Indices of relationship, based on type classifications rather than continuous scores, were obtained by excluding the few subjects who were in the indeterminate category on one or both scales being correlated and computing phi coefficients, which appear in Table 6, from the resulting four-fold tables. The phi coefficients in the four groups range from .00 to .31 (disregarding sign) and the pattern of relationships between type categories for the groups is similar. The J-P and S-N scales are significantly related in all four groups, the J-P and T-F scales are significantly related in both high school groups, and the J-P and E-I scales are significantly related for the LIU men.

Insert Table 6 about here

The patterns of product-moment correlations between continuous scores, observed in Table 7, are similar to those obtained with the phi coefficients for the type category comparisons. These correlations in the four groups range from .01 to .47 (disregarding sign). Again, the J-P and S-N scales are significantly correlated in all four groups, and the J-P and T-F scales are significantly correlated in three of the four groups.

Insert Table 7 about here

Similar results were obtained in two factor analyses of Indicator scores for other groups. Saunders (1960) factor analyzed the Indicator (Form F) and the Study of Values administered to 1132 students from Rensselaer Polytechnic Institute and Amherst. Each Indicator scale was divided into three subscales and Parts I and II of the Study of Values were scored separately. Nine significant common factors were estimated to be present, and the covariance matrix was analyzed with a double-centered factorization technique because of the ipsative nature of the Study of Values scores. The factor matrix was then converted into a correlation metric and the factors rotated orthogonally by pattern quartimax to a pattern defined by the four Indicator scales. As Table 8 indicates, the first factor loaded the E-I scale, the second loaded both the S-N scale and, to a lesser degree, the J-P scale, the third loaded the T-F scale, and the fourth loaded the J-P scale.

Insert Table 8 about here

Ross (in preparation) did a principal components factor analysis of scores on the Indicator (Form E and F), 15 ability tests, 7 interest information tests, and 10 Personality Research Inventory (PRI) scales administered to 722 boys and 718 girls in Massachusetts high schools. All tests were given in the sophomore year, except the Indicator which was given in the senior year. The male factor matrix was rotated orthogonally by pattern quartimax to a pattern defined by the four Indicator scales. As indicated by the factor loadings in Table 9, the first factor loaded the E-I scale, and to a lesser extent, the J-P scale; the second factor loaded the S-N scale, and, to a lesser extent, the J-P scale; the third factor loaded the T-F scale; and the fourth factor loaded the J-P scale.

Insert Table 9 about here

Reliability

Internal-Consistency Reliability

The internal-consistency reliability of the type categories was assessed by a lower-bound reliability estimate developed by Guttman (1946) for qualitative items. It is based on the notion that a qualitative item is reliable to the extent that it is related to one or more sets of experimentally independent items.[8] These reliability coefficients, which were computed separately for the 397 male and 614 female Massachusetts high school students and the 300 male and 184 female Long Island University freshmen, appear in Table 10. The largest is .73 and most are in the .40's and .50's. The T-F scale consistently had the lowest reliability.

Insert Table 10 about here

The internal-consistency reliability of the continuous scores was estimated by Cronbach's Coefficient Alpha (Cronbach, 1951), which is a generalized form of Kuder-Richarison Formula 20. These reliability coefficients in Table 11, which were computed separately for the same four student groups, are generally in the .70's and low .80's. The

T-F scale had consistently lower reliability than the other scales; its reliability coefficients ranged from .64 to .74.

Insert Table 11 about here

Retest Reliability

Only one small study bears on the retest reliability of the Indicator. Forty-one members of an elementary psychology class at Amherst were retested 14 months after they had been tested with their entire class shortly after entering school. These 41 students were similar to the 217 other members of their entering class in terms of Indicator type categories and continuous scores. Neither χ^2 analyses of type distributions on each of the four scales, which appear in Table 12, nor t tests of differences in mean scores and F tests of differences in variances, in Table 13, yielded any differences between the two groups which were significant at the .05 level.

Insert Tables 12 and 13 about here

In determining the test-retest reliability of the type categories, the three categories for each scale were retained but were considered as representing a nominal scale. A coefficient of agreement for nominal scales, Kappa (Cohen, 1960), was employed. Kappa is the proportion of agreement after correction for agreement expected by chance.[9] Students were classified, separately, for each scale, in three by three tables based on their original and retest type category (e.g., classification as E, X, or I originally and on retest), and the Kappa coefficients were computed. These four Kappa coefficients, which appear in Table 14, range from .30 to .65. All are significantly different from zero at the .05 level or less. The J-P type classifications were least stable.

Insert Table 14 about here

Original-retest agreement on the four-variable type combinations (e.g., ESTJ) was computed from a 20 by 20 table based on all 20 type combinations present in either the original testing or retesting. Chance agreement was .07, actual agreement was .20, and the Kappa coefficient of .13 is significantly different from zero at the .01 level.

The stability of the continuous scores was also assessed. Product-moment correlations between the original and retest scores, which appear in Table 15, range from .69 to .73 for E-I, S-N, and J-P scales, but the corresponding correlation for the T-F scale is .48. These correlation coefficients rank the scales differently from the Kappa coefficients.

Insert Table 15 about here

Validity

Concurrent Validity

Gray-Wheelwright Psychological Type Questionnaire. Among the several comparisons that have been made of the Indicator with other scales measuring similar variables, the most relevant is its relationship to the Gray-Wheelwright Psychological Type Questionnaire which was constructed similarly, is based on Jungian typology, measures E-I, S-N, and T-F directly and J-P indirectly[10] (Gray, 1947a; Gray, 1948; Gray, 1949a; Gray & Wheelwright, 1946), employs type categories although continuous scores are derivable, and has been used in a variety of published studies (Gray, 1945; Gray, 1946; Gray, 1947b, Gray, 1949b; Gray & Wheelwright, 1944). Many of these studies resemble those described in this paper and studies by Myers which are described by Stricker (in preparation).

The Indicator and the 14th edition of the Gray-Wheelwright inventory[11] were administered in counterbalanced order to the 51 students in two undergraduate psychology classes at Golden Gate College, and the results for the 47 men were analyzed. About half of the group was in the evening session--the age range was 19 to 55. Indices of relationship, based on type categories, within and between each inventory were computed by excluding the few students in the indeterminate category on either of the two subscales being compared and by computing phi coefficients from the resulting four-fold tables. As Table 16 indicates, the phi coefficients between the corresponding scales are .64 for E-I, .34 for S-N, and .54 for T-F. All of these relationships are significant at the .05 level or less.

Insert Table 16 about here

Product-moment correlations between continuous scores on all Indicator and Gray-Wheelwright scales, which appear in Table 17, yield a similar pattern. The correlations between corresponding scales, which range from .58 to .79, are all significant at the .01

level. Split-half reliability coefficients appear in the diagonal entries of Table 17.

Insert Table 17 about here

Other Extraversion-Introversion Scales. Correlations between the E-I scale, scored continuously, and other extraversion scales appear in Table 18. The E-I scale is highly correlated (.63 to .75) with the Extraversion scale of the Maudsley Personality Inventory and the MMPI Si scale which is adapted from the Social Introversion scale of the Minnesota T-S-E. It only correlates -.23 with the MMPI Sc scale which represents, at best, an extreme form of introversion. It correlates markedly higher with the PRI Talkativeness scale (.46 and .53) than the PRI Gregariousness scale (.17 and .18).

Insert Table 18 about here

Peer Ratings. The relationship of Indicator type classifications to type classifications by peers was determined for the Massachusetts high school students. At the time the Indicator was administered, each student completed a peer rating form which included 16 paragraphs prepared by Myers, each paragraph describing one of the 16 type combinations.[12] Students were instructed to choose some student in their home room who fitted each description (the same student could be chosen for more than one of the descriptive paragraphs). Thus students indirectly made type classifications of their fellow students.

In contrast to the student classifications which result from these instructions, the Indicator classified each student only one way (e.g., as an ESFJ, not both ESFJ and ESFP) and students in a given home room were not necessarily classified into all 16 types; conceivably the Indicator might classify them all the same. Since these rating instructions tend to reduce the possible agreement between students and Indicator type classification, only type classifications which the students rated "a perfect description as far as it goes of the student you have chosen" were analyzed. The 1470 such type classifications by 464 students were compared with the type classification made by the Indicator (e.g., Jones indicated that Smith was described by an ENTJ paragraph and Smith's type classification on the Indicator was or was not ENTJ).

Agreement between the Indicator and peers' type classification for each of the 16 types was measured by phi coefficients computed from 16 four-fold tables.[13] As Table 19 indicates, seven of the 16 phi coefficients are significant at less than the .05 level, but none exceeded .10. There was slightly more agreement for sensing than intuitive type classifications; no other patterns were apparent.

Insert Table 19 about here

Over-all agreement on each of the four type dimensions, considered separately, was measured by Kappa coefficients computed from two by three tables based on two-category classification by the student and three-category classification by the Indicator (there were indeterminate type classifications by the Indicator but not by the students). The Kappa coefficients, which appear in Table 20, for each of the four dimensions are similar--the highest Kappa coefficient is .15. All are significant at the .05 level or less.

Insert Table 20 about here

The extent to which these results may be due to unreliability of students' classifications is unknown; the complexities of the rating task preclude an adequate reliability estimate.

Predictive Validity

Academic Criteria. In parallel studies of male freshman at Wesleyan University (N = 225)[14] and California Institute of Technology (Cal. Tech.) (N = 201) relationships were examined between continuous scores on the Indicator scales and freshman-year grade point average (GPA), over-under achievement, and, for Cal. Tech., dropout during freshman year (since only one student left Wesleyan during the freshman year, the use of a dropout criterion for Wesleyan was precluded). Over-under achievement was measured by the difference between actual freshman GPA and freshman GPA predicted from the College Entrance Examination Board's Scholastic Aptitude Test verbal (SAT-V) and mathematics (SAT-M) sections.

Of the Indicator correlations with the criteria, which appear in Table 21, three at Wesleyan University were significant at or less than the .05 level. The E-I scale correlated -.18 with GPA, and the J-P scale correlated .24 with GPA and .27 with over-under achievement.

None of the Indicator scales were significantly correlated with any criteria at Cal. Tech.

Insert Table 21 about here

Although multiple correlations may shrink considerably when cross-validated, comparisons of multiple correlations based on different combinations of variables are informative. As Table 22 indicates, the multiple correlation, for Wesleyan University students, between the four Indicator scales and GPA was .35 and over-under achievement was .31. Each is significant at the .01 level. The corresponding beta weights in Table 23 indicate that the J-P scale accounted for most of these correlations. At Cal. Tech., the corresponding multiple correlation was .20 with GPA, .19 with over-under achievement, and .15 with dropout; and the beta weights indicate that the J-P and S-N scales were the most potent. None of the Cal. Tech. correlations are significant at the .05 level.

The multiple correlations in Table 22 with both Wesleyan criteria based on three common academic predictors (SAT-V, SAT-M, and high school rank[15]) and the Indicator scales were significantly larger at the .05 level or less (one-tailed test) than the multiple correlations based only on the three common predictors. The multiple correlation with GPA was .54 for the three predictors and .60 for the seven predictors; the multiple correlation with over-under achievement was .44 for the three predictors and .52 for the seven predictors. None of the multiple correlations of the three common predictors with the Cal.

Tech. criteria are significantly increased by the addition of the Indicator scales.

It is unknown if the observed improvement in predictions at Wesleyan, resulting from the addition of the Indicator scales to the three common predictors, would persist if the multiple correlations were cross-validated and the variance of the Indicator scales curtailed by using them in selection, just as the three common predictors are currently used.

Insert Tables 22 and 23 about here

Saunders (1957), using Indicator (Form C) type classifications and an Indicator measure of "strain," rank-ordered 13 Rockefeller Theological Fellows at Yale Divinity School on the basis of a clinical prediction of their adjustment to a divinity student role. This rank order had a tau correlation of .71 (significant at the .01 level) with the students' later plans to return or not to return to school for the second year. The extent to which the rank-ordering was based on the "strain" measure, which is irrelevant in the assessment of the validity of the four basic Indicator scales, is unknown.

These data were reanalyzed to assess the validity of each of the four scales, considered separately. The two student groups do not differ significantly in the distribution of type categories, which appear in Table 24, on any of the scales. The values, equivalent to two-tailed probabilities, computed by Fisher's Exact Probability Test from the four-fold table for each scale--indeterminate type categories excluded--were .24 for the E-I scale, .99 for the S-N scale, .36 for the T-F scale, and .49 for the J-P scale.

Insert Table 24 about here

Vocational Criteria. Only one study has examined the ability of the Indicator to predict job turnover and differentiate between employees on different job assignments. The results (Laney, 1949) for 598 men who took the Indicator (Form C) just after being hired by the Washington Gas Light Company between 1945 and 1947 were reanalyzed to assess type differences between those resigning and those remaining as of December, 1948, and type differences among those whose last assignment was to a mechanical, clerical, or some other job.[16] X^2 tests, which appear in Table 25, of the type distributions on each scale of those remaining and those resigning, indicate for the total group of employees, disregarding job assignment, significantly more turnover among employees classified as intuitive rather than sensing, and perceiving rather than judging. (The corresponding phi coefficients are .16 for the S-N scale and .13 for the J-P scale.) When employees on clerical, mechanical, and other jobs are analyzed separately, there is significantly more turnover on mechanical jobs of employees classified as intuitive rather than sensing, and perceiving rather than judging. (The corresponding phi coefficients are 17 for the S-N scale and .16 for the J-P scale.) None of the other differences for the total group or the three subgroups approach significance.

These significant results are confounded with group differences in intelligence, as measured by the Wonderlic Personnel Test. The total group of employees classified as intuitive were more intelligent than those employees classified as sensing (t = 3.74), and those classified as perceiving were more intelligent than employees classified as judging (t = 4.09). When intelligence is partialled out, the correlations between Indicator type categories and turnover decrease from .16 to .12 for the S-N scale, and .13 to .09 for the J-P scale. The partial correlation for the S-N scale, but not the J-P scale, is significant at the .05 level or less.

These partial correlations, which are based on the data originally reported by Laney, are only rough estimates, because the zero-order correlations were not always based on the same number of cases (employees with indeterminate type classifications had been excluded from some comparisons). Explanation of these findings in terms of intelligence differences assumes that intelligence is related to turnover on mechanical jobs but not clerical jobs. No data exist on the validity of such an assumption in this study.

Insert Table 25 about here

As Table 26 indicates, clerical and mechanical employees did not differ significantly in any of their type distributions.

Insert Table 26 about here

Construct Validity of the Scales

The construct validity of the Indicator can be assessed on two distinct levels. The first level involves the meaningfulness of the four scales, qua independent scales, in reflecting the postulated dimensions, as determined by their network of relationships with other test and non-test variables. The second level of construct validity focuses on evidence bearing on the existence of the interlocking types which are believed to underlie the four scales. This evidence is largely concerned with the distributions of the Indicator scores, the nature of the regression of other variables on the Indicator scales, and interactions among the Indicator scales.

Score differences on Aptitude, Interest and Achievement Tests. Dunn[17] found that the Indicator is related to a number of tests. Male and female entering freshmen at Brown University and Pembroke College were separately classified into 12 groups on the basis of their Indicator type classification (the J-P classification was ignored but four indeterminate type groups were included) and over-all differences in the means of these groups were examined by one-way analyses of variance of 23 different scores from aptitude, achievement, and interest tests. As Table 27 indicates, for both sexes, there were frequently significant differences on scales measuring intelligence, reading ability, and achievement in mathematics and science. Differences were also obtained on some interest scales for men and almost all interest scales for women.

Insert Table 27 about here

Factor Analysis With Study of Values. In Saunders' factor analysis of the Indicator and the Study of Values, the procedure for which was described earlier, 14 of 16 predictions were confirmed about which Indicator scale factors would load each of the Study of Values scales (e.g., it was predicted, in effect, that the Theoretical scale would negatively load the factors marked by the E-I and S-N scales and positively load the factor marked by the T-F scale). Saunders suggests that the Indicator scales define a simple structure with respect to which the Study of Values scales exhibit a bipolar structure. (The correlations between the Indicator subscales and the Study of Values subscales appear in Table 28 and the factor loadings in Table 8.)

Insert Table 28 about here

Factor Analysis With Aptitude, PRI, and Interest Information Scales. In the first stage of Ross' factor analysis of the Indicator aptitude, PRI, and interest information scales, the procedure for which was described earlier, the nine factors extracted from the matrix for the male subjects were rotated by the quartimax method to orthogonal simple structure, and the nine factors from the matrix for female subjects were rotated to a pattern defined by the male factor structure. (The correlations between the Indicator scales and the other scales appear in Table 29, the means and standard deviations in Table 30, and the factor loadings in Table 31.)

Insert Tables 29, 30, and 31 about here

The E-I scale only loaded an Extraversion-Introversion factor (Factor III) identified by high loadings on the PRI Talkativeness scale and lower loadings on the PRI Gregariousness scale. The S-N scale had its highest negative loadings on (a) a General Ability factor (Factor I) identified by high positive loadings on vocabulary and, for men only, science and literature information; (b) an Intellectual Attitude factor (Factor IV) identified by positive loadings for Liking to Use Mind; (c) a Speed factor (Factor II), for men only, identified by high positive loadings on Cancellation and Hand Dexterity B. Little of the variance of the T-F scale was accounted for; it only loaded (negatively) a factor (Factor VII) tentatively identified as Thoughtfulness for men because of its negative loadings on Self Sufficiency and Attitude Towards Work but unidentified for women. The J-P scale had a different pattern of loadings for men and women; it loaded (a) for both men and women, a Prudence factor (Factor V) identified by positive loadings on Altruism and Attitude Towards Work and a negative loading on Impulsion; (b) for women only, the General Ability factor (Factor I); and (c) for women only, an unidentified factor (Factor VIII) loading Masculinity-Femininity, Tool Knowledge, Sentence Completion, and Spiritualism vs. Materialism. No Indicator scale appreciably loaded a Speed of Decision factor (Factor VI) identified by positive loadings on Social Judgment, Metaphors, and Free-Floating Anxiety, or an unidentified factor (Factor IX), loading Letter Set, Paper Folding, Arithmetic Reasoning and Attitude to Work for men, and Arithmetic Reasoning, Carefulness, Sentence Completion and Literature and Home Economics information scales for women.

In a second stage of this factor analysis, the male factor matrix was rotated by pattern quartimax to a pattern defined by the four Indicator scales and 13 of 16 predictions about the relationships between Indicator factors and the personality and interest scales were confirmed. The predictions were made by substituting these scales for the Study of Values scales in Saunders' predictions about the relationships between the Study of Values and the Indicator (e.g., the PRI Liking to Use Mind scale was substituted for the Study of Values Theoretical scale). In addition, 33 of 41 predictions about tests corresponding to unique characteristics of types were confirmed; these predictions were based on Myers' description of the characteristics of types in high school. (These factor loadings appear in Table 8.)

Correlations with Aptitude, Values, and Personality Scales. The correlations between the Indicator and SAT scales for 201 Cal. Tech. students appear in Table 32. SAT-V had significant negative correlations with the S-N and J-P scales. SAT-M was not significantly correlated with any Indicator scale.

Insert Table 32 about here

Table 33 reports, for the 225 Wesleyan students, the correlations between the Indicator and the SAT, Concept Mastery Test, Brown-Holtzman Survey of Study Habits, Davis Reading Test, General Reasoning subtest of the Guilford-Zimmerman Survey, Science Research Temperament Scale, Ship Destination Test, Study of Values, MMPI, and EPPS.

As in Ross' factor analysis, the S-N scale had significant negative correlations with ability measures. In addition, so did the E-I scale.

The pattern of significant correlations between the Indicator and the Study of Values and the EPPS is difficult to interpret because of the ipsative nature of the latter scales. On the Study of Values, the E-I scale correlated negatively with the Aesthetic scale, the S-N scale correlated positively with the Economic and Political scales and correlated negatively with the Aesthetic scale, and the T-F scale correlated positively with the Theoretical, Economic, and Political scales and correlated negatively with the Social and Religious scales.

On the EPPS, the E-I scale correlated positively with the Exhibitionism and Dominance scales and negatively with the Deference and Abasement scales. The J-P scale correlated positively with the Orderliness and Endurance scales and negatively with the Change scale. The S-N scale correlated positively with the Orderliness and Deference scales and negatively with the Autonomy scale, and it was uncorrelated with the Intraception scale. The T-F scale correlated positively with the Orderliness, Endurance, and Dominance scales, and correlated negatively with the Nurturance, Affiliation, Succorance, Abasement, and Heterosexuality scales.

The J-P scale had a significant positive correlation with the Brown-Holtzman Survey of Study Habits and, like the S-N scale, a significant negative correlation with the Science Research Temperament scale.

The Indicator had low but significant correlations with the MMPI. The E-I scale correlated positively with Ma and negatively with D, Pt and Mf--and Sc and Si as described earlier. In addition, it correlated positively with K and negatively with F. The S-N scale's only significant correlation--negative--was with the Mf scale. The T-F scale correlated negatively with both Mf and Pt, and correlated positively with L. The J-P scale correlated negatively with Sc, Pd, and Ma. It also correlated positively with K and negatively with F.

Insert Table 33 about here

For a group of 52 female students at Trenton State Teachers College, as Table 34 indicates, the Maudsley Personality Inventory Extraversion Scale correlated positively with the E-I scale, as noted earlier, and negatively with the S-N scale. Its Neuroticism scale correlated positively with the S-N scale and negatively with the E-I and T-F scales. The Christie Anxiety Scale was not significantly correlated with any of the Indicator scales.

Insert Table 34 about here

Correlations with Aesthetic Judgment and Personality Measures. Child[18] obtained scattered significant correlations between the Indicator and aesthetic judgment and personality scale scores and ratings for 22 Yale and 22 Stanford students. These results appear in Table 35. The E-I scale correlated positively, as mentioned earlier, with Extraversion, and, for Yale students only, with Viscertonia. It correlated negatively, for Stanford students only, with Tolerance of Ambiguity. The T-F and J-P scales both correlated positively with Neuroticism in one of the two samples. For the Yale sample, the E-I scale correlated negatively with the Barron-Welsh Art scale and an art information rating. The S-N scale correlated positively with the Barron-Welsh Art scale only for the Stanford sample. The T-F scale correlated positively with preferences for poetic sentences.

Insert Table 35 about here

Correlations with the Strong Vocational Interest Blank. The correlations of the Indicator with the Strong Vocational Interest Blank scales, for 727 male freshmen at Stanford University, appear in Table 36. The E-I scale correlated positively with uplift (Group V) and business contact (Group IX) scales, and correlated negatively with creative-scientific (Group I) and technical (Group II) scales. The S-N scale correlated positively with business detail (Group VIII) and business contact (Group IX) scales, and negatively with creative-scientific (Group I), technical (Group II) and uplift (Group V) scales. The T-F scale correlated positively with the technical (Group II) scales and negatively with uplift (Group V) scales. The J-P scale correlated positively with the business detail (Group VIII) scales and negatively with the creative-scientific (Group I) and verbal (Group X) scales.

Insert Table 36 about here

Student Group Differences. A number of comparisons have been made of the distribution of type categories and type scores for different groups. A number of group differences are evident in the distribution of type categories appearing in Table 58, and means and standard deviations of scores appearing in Table 59 for the high school students, male liberal arts college students (combined results for the Class of 1963 at Amherst, Dartmouth, Stanford, and Wesleyan), male engineering school students (combined results for the Class of 1962 at Cal. Tech. and RPI, and the Class of 1963 at MIT and Cornell College of Engineering), and LIU students.

There were sex differences on the scales as determined by X^2 tests of type distributions, which appear in Table 37, and t tests of mean scores, which appear in Table 38, of the boys and girls within the college preparatory and general-vocational high school groups and the male and female LIU students. These sex differences were found for the high school students: within the college preparatory group, more of the girls than boys were classified as sensing and feeling, and the girls had higher mean scores on the S-N scale and lower mean scores on the T-F scale. In the general-vocational group, girls, in comparison with the boys, had lower mean T-F scores. More of the girls were classified as judging, and the girls had higher mean J-P scores. Similar results were found for the LIU students. More of the girls were classified as sensing and feeling, and the girls had higher mean E-I, S-N and J-P scores and lower mean T-F scores.

There were differences between students in the college preparatory and general-vocational high school program. Among the boys, more of those in the college preparatory program were classified as extraverts and had a higher mean E-I score, were classified as intuitive and had a lower S-N score, and were classified as thinking and had a higher mean T-F score. Among the girls, more of those in the college preparatory program were classified as intuitive and had a lower mean S-N score and were classified as perceptive and had a lower mean J-P score.

Insert Tables 37 and 38 about here

There were differences between high school boys in the college preparatory program and male students in liberal arts colleges and engineering schools. (The χ^2 tests for the type classifications appear in Table 39 and the t tests of mean scores appear in Table 40.) More liberal arts college students than high school students were classified as introverts and intuitive. The liberal arts students also had lower mean E-I and S-N scores.

More engineering school students than high school students were classified as introverts, intuitive, and thinking. The engineering students had lower mean E-I and S-N scores and higher mean T-F and J-P scores.

There were differences between the male students in liberal arts colleges and engineering schools. More liberal arts college students were classified as extraverts, sensing, feeling, and perceiving, and the liberal arts students had higher mean E-I and S-N scores and lower mean T-F and J-P scores.

Insert Tables 39 and 40 about here

The type distributions for three specialized, largely male, student groups (14 architectural students--including two women, 26 engineering students, and 69 medical students) which appear in Table 41 only differed significantly in E-I. X^2 tests (corrected for continuity) of differences in E-I type classifications for all possible pairs of groups which appear in Table 42, indicate that this overall difference arises largely because more architectural students than either the engineering or medical students were classified as extraverts.

Insert Tables 41 and 42 about here

Saunders (1957) examined Myers' assertion that people classified as ENFJ and ESFJ were best at jobs dealing with people, including preaching, by comparing the frequencies of the 16 Indicator types for Yale Divinity School (Form C) and Southern Baptist Seminary (Form D) students with the frequencies for a composite group of graduate students (business, medicine, psychology, education, and engineering) (Forms C and D). For Yale, the largest discrepancy between observed and expected type frequency was for ENFJ, and for Southern Baptist Seminary the largest discrepancy was for ESFJ. The prediction was also confirmed that the ENFJ type classification would predominate in relatively liberal religious groups, and the ESFJ type classification in relatively conservative religious groups; there were more students classified as ENFJ than ESFJ at Yale, which is very liberal and unaffiliated with any denomination, than at the Southern Baptist Theological Seminary. (The X^2 of 14.9 is highly significant, with a probability value of .00006.) A reanalysis of these data, appearing in Table 43, indicates significant differences between these two schools in the over-all type distributions. A greater proportion of Yale Divinity School students were classified as introverts, intuitive, and thinking.

Insert Table 43 about here

Differences Among Creative Members of Different Occupations. After comparing the type distributions of members of occupational groups who are considered by their peers to be creative, MacKinnon has concluded (MacKinnon, 1959a; MacKinnon, 1959b; MacKinnon, 1959c; MacKinnon, 1959d; MacKinnon, 1959e) that artistic creative persons (e.g., writers) are predominantly perceiving, while scientific creative subjects tend to be judging; creative people in different occupations tend to differ in thinking-feeling, and the majority are classified as introverts and intuitive.[19] These conclusions are consistent with the type distributions[20] of four groups of creative men: 40 architects, 45 research scientists (Form D), 20 creative writers (Forms D, D2, and F) and 12 mathematicians, and χ^2 tests of their over-all group differences. These data appear in Table 44. (These group comparisons are limited to type categories, and subjects with indeterminate type categories have been excluded from these particular analyses.)

Insert Table 44 about here

Since the over-all differences in T-F and J-P were significant, χ^2 tests (corrected for continuity) were made of T-F and J-P type distributions for each pair of groups and appear in Table 45. The over-all group differences in T-F arise largely because more research scientists than either architects or writers, and more mathematicians than writers were classified as thinking. Fisher's Exact Probability Test values computed from these fourfold tables which had expected cell values of five or less give the same results. Only the research scientists and mathematicians differed significantly in their J-P distribution, as determined by X^2 tests. However, Fisher's Exact Probability Test values computed from the tables with small expected cell values indicate no significant differences between any pair of groups.

Insert Table 45 about here

Differences Between Creative and Uncreative People. The ability of the Indicator to discriminate between creative and other members of an occupation has also been investigated. X^2 tests (corrected for continuity) appear in Table 46 for the type distributions of creative and noncreative members of three different groups[21]: (a) 40 creative architects and 41 other architects, matched on age and geographic location of practice (MacKinnon, 1960), (b) 10 creative college women and 16 other college women, (c) 15 creative female mathematicians and 26 other female mathematicians. There are no significant differences between the creative and the other college women, or the creative and the other female mathematicians. The architects, as MacKinnon has indicated, differ significantly on the S-N scale--more creative architects were classified as intuitive; the corresponding phi coefficient is .23. The Fisher Exact Probability Test values which were computed, where required, give the same results.

Insert Table 46 about here

Type Similarity and Liking. Two studies investigated the hypothesis that people of similar types will be more apt to like each other. One study involved female Directors of Religious Education (DRE) of the Episcopal Church (Saunders, 1957). It was predicted that those classified by the Indicator (Form D) as ENF- would have higher subsequent effectiveness ratings by rectors and laymen than the DRE's with different type classifications because many rectors would be ENF-. The difference in mean ratings of the 12 classified as ENF-, and the other nine who were not classified as ENF-, was in the predicted direction but only significant at the .08 level with a one-tailed test. However, there was a tau correlation of .34 between ratings and membership vs. nonmembership in ENF- which was significant at the .05 level. It is uncertain to what extent the effectiveness ratings confound liking with actual effectiveness.

In a second study, 44 three-women groups were set up (Smucker, 1959). The members of each group were matched on several characteristics. In 33 of the groups, two members were both classified by the Indicator (Form E) as extraverts or introverts; in 40 groups, two members were both classified as sensing or intuitive; in 20 groups, two members were both classified as thinking or feeling; and in 31 groups, two members were both classified as judging or perceiving. Each group was told that the purpose of the experiment was to see to what extent three strangers can come to know each other in a brief time, and then the group was left together for 15 minutes. The group members then completed questionnaires describing their preferences for other members of the group. Of the 50 subjects who were similar to another group member in at least three type categories, 27 chose that member for a "close relationship" (the x^2 of .32 is not significant at the .05 level) and 29 chose that member as most similar to herself (the x^2 of 1.28 is not significant at the .05 level).

For each of the four scales, the preference of the two members in each group who were classified in the same type were reanalyzed. The phi coefficients between the type classification of these subjects and the type classification of subjects they chose were .04 for E-I, .08 for S-N, -.07 for T-F, and .14 for J-P. None of these phi coefficients are significant at the .05 level; the two members did not tend to choose each other rather than the third member who had a different type classification.

Smucker's hypothesis that more extraverts than introverts would be interested in the experiment was confirmed; 39% of the 66 subjects classified as extraverts but only 19% of the 45 subjects classified as introverts reported "high" interest (the x^2 of 3.05 is significant at the .05 level).

Age. The relationship of the Indicator type categories to age was investigated in one study. Point biserial correlations were computed, separately for each sex, between the two type categories (subjects with indeterminate categories were excluded) for each Indicator scale (Form E) and the age of 82 male and 241 female elementary school teachers in Covina, California. As Table 47 indicates, only the correlation (r = -.17) of S-N with womens' ages was significant. It is not certain to what extent these correlations may be affected by other influences, in addition to age, per se, such as changes in teacher selection practices which are associated with type classifications.

Insert Table 47 about here

Response Sets. Responses to personality inventories typically change in situations where a person wishes to present a favorable or unfavorable picture of himself. Even in research situations, people tend to make socially desirable responses (cf. Edwards, 1957). There is a pattern of significant correlations between the Indicator and MMPI validity and SD scales in the Wesleyan data (Table 33). The E-I scale correlated positively with K, Edwards SD scale (.38) and a balanced SD scale, designed to reduce content and acquiescence effects (Stricker, 1961). The T-F scale correlated positively with the L scale and the Edwards SD scale. The J-P scale correlated positively with the K scale and the two SD scales and correlated negatively with the F scale.

Indicator scales may also be affected by a set to choose the first or last alternative, which would make a difference since the position of the keyed alternatives are not balanced. The first item alternative of the 22 E-I items is keyed E for 15 items and I for 5 items; the first item alternative of the 26 S-N items is keyed S for 16 items and N for 5 items; the first item alternative of the 23 T-F items is keyed T for 9 items for both the male and female keys, and

F for 10 items for the male key and 9 items for the female key; the first item alternative of the 24 J-P items is keyed J for 13 items and P for 7 items. If a person chose the first alternative to each item, his score would be E12, S15, F02, and J13; if he chose the last alternative, his score would be I16, N06, F01, and P16.

Construct Validity of the Typology

Bimodality. The existence of bimodal distributions of Indicator scores would tend to support the hypothesis of underlying types and Myers has reported finding such distributions in her early research (Myers, 1945; Stricker, in preparation).

Lord (1958) investigated bimodality in the score distributions of the four Indicator (Form D) scales for 2,297 male students from Cal. Tech., Dartmouth, Rutgers, M.I.T., and Stanford. Using a procedure developed by S. S. Wilks, scores were grouped into two-score class intervals, and the difference in frequencies between each pair of adjacent intervals was examined to see if they conformed to one relationship expected in a unimodal distribution, *viz.*, if the observed scores had been drawn from a unimodal distribution of scores having a population proportion π_i of its scores in class interval i, then unimodality would require that there exists a class interval I (containing the mode) such that

$$\begin{cases} \pi_{i+1} - \pi_i \geq 0, \text{ for all } i < I, \\ \pi_{i+1} - \pi_i \leq 0, \text{ for all } i \geq I \end{cases}$$

Confidence intervals[22] based on the observed proportions were constructed for each $(\pi_{i+1} - \pi_i)$ to determine if for some I each confidence interval included a value of $(\pi_{i+1} - \pi_i)$ satisfying the above relationship. The obtained confidence intervals for each scale, which appear in Table 48, permit positive values of $(\pi_{i+1} - \pi_i)$ for all class intervals below the mode and negative values for all class intervals at or above the mode; therefore, it was concluded that the null hypothesis that all four distributions were drawn from unimodal populations could not be rejected.

Insert Table 48 about here

In order to increase the efficiency of the significance test, in a second stage of the study, the locations of modes and antimodes were identified in a random sample of 721 students from the larger group. The significance test was then applied to the distributions of the remaining sample, ignoring class intervals in which modes and antimodes had not been found in the sample of 721 students. The results were the same as in the main study.

The distributions in Figure 1 of scores for the 397 boys in all high school programs, the 2,177 male liberal arts college students, and the 2,389 male engineering students seem to be reasonably typical. A casual inspection of them indicates no marked evidence of bimodality, although there is considerable skewness.

Insert Figure 1 about here

Curvilinear Regressions. The existence of regressions of other variables on Indicator scales which change in slope or level at the scale zero point would also support the existence of an underlying typology.

Myers presents data suggesting that the regression of certain academic variables (intelligence test scores, over-under achievement, years of education, and proportion of high school students in the college preparatory program) on either the E-I or S-N scales is slight within each type category, but that the level of regression jumps sharply and discontinuously near the zero point separating the categories (Myers, 1945; Myers, 1958; Stricker, in preparation).

Two recent studies examined the regression of verbal and mathematical aptitude tests and GPA on Indicator scales. In each study, Indicator scores were grouped in intervals of three units each and extreme intervals combined so that each interval contained at least six students. Scores for the other variables, which were all two digits, were grouped into intervals of two units each, except for the mathematical aptitude test scores in the first study, which were left ungrouped. The significance of departures from linearity of regression was assessed by the F test of the difference between the corresponding correlation coefficients and correlation ratios.

In the first study, the regressions of vocabulary and arithmetic reasoning tests on each Indicator scale (Forms E and F) were determined separately for the 722 male and 718 female Massachusetts high school students. These results, which appear in Table 49, indicate that six of the 16 regressions departed significantly from linearity and five of these six involved the regression of the vocabulary test. These six regressions appear in Figure 2. The effect on the regressions of the two-year lapse between administration of the aptitude tests and the Indicator is unknown.

Insert Table 49 about here

Insert Figure 2 about here

In a second study, the regression of SAT-V, SAT-M, and freshman-year GPA on each Indicator scale was examined for 828 male freshmen at Stanford University. These results, which appear in Table 50, indicate that the regression of SAT-V on the S-N scale and the regression of GPA on the T-F scale both depart significantly from linearity. These two regressions appear in Figure 3.

Insert Table 50 about here

Insert Figure 3 about here

The U-shaped regression of the vocabulary test on the T-F scale for the boys in the first study seems to change in slope in the area of the T-F scale's zero point. None of the other significantly non-linear regressions, in either study, seem to change markedly at, or even near, the zero point. In addition, none of these regressions appear to be discontinuous in the region of the zero point (where discontinuous is defined as a sudden jump in the regression). The ability measure regressions on the S-N scale are roughly step-shaped, and most of the other regressions have a saw-toothed shape.

To examine the regression of proportion of high school students enrolled in college preparatory programs on Indicator scales, 376 male and 581 female Massachusetts high school students were classified by their school program, and the proportion of students in each five-point Indicator score interval who were in the college preparatory program was computed separately for boys and girls. The regression of these proportions on each Indicator scale are presented graphically in Figure 4. Again, there does not appear to be any marked change in the regressions at or near the scales' zero point. The regressions on the S-N scale again are roughly step-shaped, and the regression on the T-F scale for the boys is slightly U-shaped. The other regressions have a variety of shapes.

Insert Figure 4 about here

Interaction Among Type Dimensions. Since the notion of interaction between the Indicator scales is explicit in both the typological theory underlying the Indicator and the treatment of the Indicator scores (i.e., all four scores should be considered together), the existence of interaction among the scales in relation to four important academic variables was investigated by analysis of variance. Results for the male Stanford University freshmen were analyzed. At least ten students were in each of the 16 type classifications (indeterminate type classifications were ignored), so ten were randomly selected from each of the type classifications and classified by their type classification in a 2x2x2x2 factorial design. Separate analyses of variance were made of four of these students' variables: SAT-V, SAT-M, freshman-year GPA, and freshman-year over-under achievement (actual GPA less GPA predicted from SAT-V and SAT-M, as computed for the same group of 160 students). As the mean squares and F ratios for these analyses of variance which appear in Table 51 indicate, four main effects (S-N and J-P classifications with both SAT-V and SAT-M), but no first-, second-, third-, or fourth-order interactions among the scales, were significant.

Insert Table 51 about here

Moderator Properties. Implicit in the typological theory is a distinction between phenotypical and genotypical behavior--even though people of different types may behave similarly, their behavior results from different combinations and patterns of surface traits which are peculiar to their type. One implication of this notion is that the regression equations for predicting a given behavior would depend upon the subjects' type classification; different weights for the predictors or entirely different predictors would be required for subjects in the various type classifications. This hypothesis that the Indicator moderates (Saunders, 1956) the predictions of other variables was tested by comparing the correlations of SAT scales with academic criteria (GPA, over-under achievement, and freshman dropout) for Wesleyan and Cal. Tech. students within the two major categories on each scale (e.g., the SAT validities for students classified as extraverts and the students classified as introverts). (Indeterminate categories were not analyzed because few students were in them.) The zero order and multiple correlations between SAT scales and the academic criteria are reported in Table 52, and the means and standard deviations for the scales and criteria for each type group appear in Table 53. There was only one significant difference in the SAT correlations for students in the complementary type categories in either school: the correlations of both SAT scales with both GPA and over-under achievement were significantly larger for the Wesleyan students classified as thinking rather than feeling. In addition, the SAT scales were positively correlated with over-under achievement for the students classified as thinking and negatively correlated for the students classified as feeling.

Insert Tables 52 and 53 about here

Effects of Type Indeterminacy. According to both Jungian typology and Myers' version of it, failure to develop either of the several pairs of complementary functions results in fluctuating and ineffective behavior. To test this hypothesis, correlations were computed between two measures of type indeterminacy for each scale (a dichotomous measure--indeterminate or not indeterminate--based on the usual criterion of a zero difference in scores for complementary categories, and a continuous measure based on the actual difference between the two corresponding categories) and GPA and over-under achievement for the Wesleyan and the Cal. Tech. students, and freshman dropout for the Cal. Tech. students. None of these correlations, which appear in Table 54, were significant at the .05 level.

Insert Table 54 about here

Furthermore, as Table 55 indicates, there were very few significant correlations between the indeterminacy measures for the Wesleyan students and their scores on the MMPI (which was used as a rough measure of the maladjustment which should arise from the postulated conflicting and ineffective behavior). There were only two significant correlations (both were .15) with the clinical scales (a positive correlation between the J-P dichotomous indeterminacy measure and the Pa scale, and a negative correlation between the S-N continuous measure of indeterminacy with the Ma scale) which might be expected by chance because of the large number of significance tests applied to the Indicator-clinical scale correlations (80). However, J-P indeterminacy, in terms of both dichotomous and continuous measures, had a consistent pattern of low but significant correlations with the validity scales. The ? scale had significant negative correlations with both J-P indeterminacy measures, and the L scale had a significant negative correlation with the continuous measure. In addition, the K scale correlated positively with the dichotomous indeterminacy measure.

Insert Table 55 about here

Discussion

The theory, test development procedures, and the reliability and validity data which have been described bear on four issues which should be considered in evaluating the Indicator: (a) the correspondence between the typology formulated by Jung and Myers' version of it, (b) the extent to which the Indicator actually reflects Myers' typology, (c) the utility of the Indicator in predicting socially important variables, and (d) any unique and potentially useful properties of the Indicator.

Correspondence Between the Typologies

The typology formulated by Jung and Myers' adaptation of it are similar in the terminology that they employ, their definitions of most of the variables, and their conceptualization of the development and interplay of the variables. But there are also important differences between the two versions, both in emphasis and specific details.

One difference involves the conceptualization of extraversion-introversion. Jung's conceptualization, which is in terms of the direction of psychic energy and, hence, the location of the person's interest and motivation (within the subject or the environment), seems much broader than Myers' conceptualization which emphasizes interest in concepts and ideas versus things and people. While the distinction between these two kinds of interests is consistent with Jung's conceptualization, they seem to be rather specific aspects of the broader phenomena discussed by Jung.

Judging-perceiving plays a different role in the two versions. It was only used as a classificatory device in Jung's typology, but Myers added it, as a fourth variable, to her version of the typology. An explicit judging-perceiving dimension of this kind is unessential to the conceptualization since judging-perceiving is entirely dependent on the other dimensions; judging-perceiving, in effect, describes the nature of the leading function, but the leading function, at least at the level of theory, can be identified directly--it is the most developed of the four functions.

The two versions differ in the emphasis that they place on type differences and in some related details of their conceptualizations. Myers seems to place great stress on a polarization which results in clear inter- and intra-individual differences. Jung's conceptualization, in contrast, is more intricate. While type differences play a large part in it, it contains features--none of which are found in Myers' conceptualization--which make the type differences less clear-cut or even bring the opposing types into balance (i.e., the transcendent function, the notion that all the functions can be brought into consciousness, and the idea of compensation between complementary functions, even in the unconscious state).

Finally, Myers' version differs from Jung's by linking the operation of the leading function to extraversion-introversion.

Congruence Between the Indicator Scales and the Typology

Some idea of the extent to which the Indicator reflects the typology, as Myers conceives of it, can be gauged from the procedures used in constructing the Indicator, the item content of the scales, their reliability, and the network of their relationships with other variables. A consideration of these factors has certain limitations (e.g., the precise effect of certain test-construction procedures cannot be ascertained, judgment about the content of the scales may be wrong, and the nomological net is not sufficiently broad) which makes it impossible to identify the precise meaning of the scales, although they may suggest alternative meanings. However, the structural facets of the typology (e.g., the notion of underlying dichotomous types) can be verified with more certainty.

Construction of the Indicator. The procedures used in constructing the Indicator have broad implications for the correspondence between the Indicator and the typology. Its construction, which had the unique and desirable advantage of being guided throughout by the theory, involved insightful item writing, considerable effort in numerous item analyses, and ingenuity in attempting to solve both common and quite unusual methodological problems (e.g., the development of procedures for setting the scales' zero points). Still, there are certain ambiguities, unanswered, or even unanswerable, questions, and flaws in the procedures which were used which, at least, raise issues about the meaningfulness of the Indicator's classifications and scores.

1. Assumed scale bipolarity--The assumption that each of the four scales is bipolar (e.g., in any particular situation a person engages in behavior which reflects thinking or feeling, but no thinking and feeling) is implicit in the items and the scoring procedures. Items on the thinking-feeling scale, for example, require a choice between a thinking-oriented and a feeling-oriented alternative. This assumption, which is central to the typological theory, has not been verified and, since it has been built into the Indicator, cannot be tested with the Indicator itself. An alternative psychometric approach, using independent measures of each polar trait, would have provided information, not available from the Indicator, about several important issues: (a) the extent and direction of the correlation

between these polar traits and, hence, their bipolarity; (b) the strength of the third and fourth functions; and (c) the existence of two kinds of type indeterminacy--that due to lack of development of both polar traits and that due to equal development of both polar traits.

2. Comparability of the alternatives' scale position--It seems to be a reasonable assumption that people choose the alternatives which are closest to their perceived location on the relevant dimension. If this assumption is correct, the choice between the alternatives to each Indicator item is interpretable only if each alternative represents the same scale position on the pole it reflects. If the alternatives differ in scale position, a person who is near the neutral point on the extraversion-introversion dimension, for example, may choose an extravert alternative which is moderate rather than an introvert alternative which is extreme, and many people who really fall on the introvert portion of the scale may be classified as extraverts.[23] No data exist on the comparability of the scale position of the Indicator's alternatives.

3. Minimizing nonvalid variance from social desirability response set--Myers has attempted to capitalize on social desirability response set, rather than simply minimize its effects (e.g., by balancing the social desirability of the alternatives). The notion is that social desirability response set will improve measurement if the items are written so that, for example, extraverts find extravert alternatives more desirable than introvert alternatives, and introverts find introvert alternatives more desirable than

extravert alternatives. This solution is only effective if the perceived desirability does not vary with the other type dimensions (e.g., extravert alternatives must be more desirable to all eight extravert types, and introvert alternatives must be more desirable to all introvert types), but typological theory would suggest that desirability, like virtually any other variable, would vary among the type groups, presumably in a complex way because of interaction effects. No data exist on any of these issues.

4. Setting the scale zero point--Setting the zero point for later internal-consistency scores by reference to the empirical type classifications depends on the meaningfulness of their empirical type classifications (which will be discussed later) and is limited to the early versions of the Indicator, since later versions contain items not originally administered.

Setting the zero point by identification of the point separating bimodal distributions of scale scores or disparate regressions of other variables on Indicator scores is, at best, an undependable procedure since research described in this paper had been unable to identify any bimodal distributions, and, with one exception, the curvilinear regressions which were observed did not appear to change markedly in slope or level at any one point.

5. Type classification by test authors--The notion that Indicator type classifications are empirically related to actual types hinges on the accuracy and meaning of the test authors' original type classifications. No data are available about the validity of this classification or even the interjudge agreement. A person would have to be known very well--perhaps as well as a

Jungian analyst knows his patients after long-term therapy--before his type could be accurately determined. Type classification should be exceedingly difficult in the face of the assertions by both Jung and Myers that people may develop types and corresponding surface characteristics which are inconsistent with their inborn type as a result of adverse environmental influences, and Myers' assertion that the leading function is not necessarily seen in overt behavior.

Other ambiguities in the test authors' type classifications arise because the classification may have been based on surface characteristics believed to be related to the types rather than being based on the intrinsic type. Hence, relationships between type scales and surface traits may be circular rather than confirming the construct validity of the Indicator, e.g., the J-P scale may be related to compulsivity because people were originally classified as judging or perceiving on the basis of their compulsivity and hence the J-P scale items which were selected on the basis of their ability to discriminate between the two groups measured compulsivity.

6. Empirical and internal-consistency item analyses--The relationship of the empirical type classifications originally made by the test authors with the present scales is unknown. It seems likely, however, that, as a result of the repeated changes in the scales stemming from the successive item analyses, the present scales would not correlate higher with the empirical type classifications than would any set of relevant scales with similar internal-consistency.

The initial empirically derived scale was probably not highly related to the empirical type classification because the item selection indices were unstable (they were based on an accidental sample of 20 people) and the criterion for item selection was very low (60% classification accuracy).

In turn, the current scales may not be highly related--no more highly related than any set of relevant scales with similar internal-consistency--to the initial empirically derived scales on which they are based, because of the revision or elimination of the original items and the addition of new items on the basis of several successive internal-consistency item analyses. Each new version was constructed from the items (those retained from the preceding items analyses and new items) most highly correlated with total scores based on the preceding version of the scale. The correlation between successive scales may also be attenuated because, at several stages, items were revised but scored like their original versions, even though the changes may have affected the items' characteristics.

If, instead of considering these scales as empirically derived predictors of type classifications, in the tradition of the MMPI, they are evaluated as content scales which explicitly reflect some postulated construct, other ambiguities are introduced by these empirical and internal-consistency item analyses, since they may systematically exclude certain kinds of items from the relevant universe. Moreover, viewed as content scales, any items on them which are not explicitly related to the postulated construct would be irrelevant to the measurement of the construct. Using this kind of criterion, it would be difficult to justify very many items on the J-P scale, since they do not refer to judging or perceiving, *per se*, and items on the other scales would be brought into question.

Meaning of the Scales. The item content of the scales and their relationships with other variables suggest that the S-N and T-F scales may only reflect restricted aspects of the postulated dimensions and the E-I and J-P scales may reflect something quite different from their postulated dimensions.

1. The E-I scale is intended to measure a dimension that Myers describes as an interest in concepts and ideas versus things and people. Its items, which resemble those on many extraversion-introversion scales, however, seem almost without exception to describe aspects of social relations, frequently involving talkativeness. Interest and proficiency in social relations may be surface traits reflecting an underlying interest in things and people, which is one pole of the dimension, but they seem unrelated to the other pole of the dimension, interest in concepts and ideas.

This interpretation of the item content is supported by the findings that the E-I scale was much more related to the PRI Talkativeness scale than the PRI Gregariousness scale, and its relationship to the PRI Liking to Use Mind scale, which should reflect an interest in concepts and ideas, was only slight and in the wrong direction.[24]

The notion that the E-I scale may not be measuring an interest in concepts and ideas is also supported by the finding that there was a greater proportion of boys classified as extraverts in the college preparatory program (the program that should most reflect an interest in concepts and ideas) than in the vocational program. The meaning of this finding may be limited, however, because no significant differences were obtained for the girls, and these results may be affected by the greater dropout of the vocational students.

The E-I scale's relationships with other extraversion-introversion scales, other personality traits, and occupational interests make it reasonably clear that it is measuring some form of extraversion-introversion, but they do not shed any light on the two possible interpretations of the scale's meaning.

The meaning of this scale is also complicated by the scale's susceptibility to test-taking distortion, as seen by its correlations with the K and SD scales.

2. The S-N scale's items seem to describe an interest in tangible, realistic things versus an interest in abstract ideas. Interest in tangible, realistic things seems congruent with the focus of sensation on actualities, but interest in abstract ideas seems to be, at best, only one facet of intuition. Some of these items resemble those on the Thinking Extraversion scale of the Minnesota T-S-E Inventory (Evans & McConnell, 1957) and the Q_1 scale of the 16 P. F. (Cattell, Saunders, & Stice, 1957). In addition, the S-N scale and the Q_1 scale, which is presumably a measure of radicalism-conservatism, differentiate between several occupational groups in the same way.

Support for the S-N scale's conceptual definition is lent by its loadings on an intellectual attitude factor and, in addition, general ability and speed factors (the latter factors can be interpreted as correlates of sensation-intuition) and by its relationships with occupational interests.

3. The content of the T-F scale seems to describe a rational versus a sentimental approach to life. The former may correspond to thinking, in its reliance on objective criteria in evaluating phenomena,

but the latter seems quite unlike feeling, which employs subjective criteria.

The scale's relationships with other variables can be viewed, with some exceptions, as supporting either of these two interpretations and, perhaps, others as well: its loadings on a thoughtfulness factor, its relationships with occupational interests, and its differentiation between the sexes and occupational groups.

4. Although judging-perceiving is defined as reaching a conclusion about something versus becoming aware of it, the items on this scale seem to describe planned or organized versus spontaneous activity; time-binding; or even compulsivity. These items are very similar to those on the EPPS Orderliness scale (Edwards, 1953).

Such an interpretation is supported by the scale's relationships with the Brown-Holtzman Survey of Study Habits and the Science Research Temperament Scale.

Its relationships with occupational interests support either interpretation of this scale but do not allow a choice between them. The interpretation of this scale is complicated because the scale seems to have different meaning for males and females and is affected by test-taking distortion.

Finally, just as this dimension seems to be conceptually dependent on the other dimensions, intercorrelational and factor analytic findings indicate that its scale is dependent on the other scales, especially S-N.

Support for the Underlying Typology. The studies reported in this paper clearly offer little support for the features of the typology from which the Indicator scales were derived. With one or two interesting exceptions, the findings suggest that the Indicator's type classifications do not seem to be unchanging, categorical, interacting, or associated with different compounds of surface traits; and, in addition, type indeterminacy is unrelated to ineffective behavior and maladjustment.

The moderate retest reliability of the type classifications, whether considered separately or together, is contrary to the notion that the Indicator type classifications reflect underlying categories which are unchangeable, but it is understandable in view of (a) the moderate internal-consistency reliability of the type classifications and continuous scores, (b) the changes that probably occur in the subjects (college freshmen), (c) the usual fluctuations in test scores, and (d) the fact that a change in score of one point can shift a person from one type classification to another.

Neither the shape of the Indicator score distributions nor the regressions of other variables on Indicator scales--with the exception of one regression on the T-F scale--support the existence of dichotomous types. These findings are in conflict with those reported by Myers. These apparent contradictions may be explainable by limitations in Myers' data (Stricker, in preparation).

A bimodal score distribution obviously suggests that the sample contains two somewhat different kinds of people. Bimodality can also be produced by high item intercorrelations, but the Indicator's item-total score correlations do not seem high enough to produce this kind of artifact. The statistical test for bimodality applied, with negative results, to score distributions of an earlier form of the

Indicator should also be applied to score distributions of the current version, even though an inspection of the score distributions of several groups makes it appear unlikely that any bimodality is present.

As Myers asserts, regressions of other variables on Indicator scales, which change in either slope or level at the zero point of the Indicator scales, would suggest either that the people on the two sides of the Indicator scales' zero point are qualitatively different or the Indicator scale on each side of the zero point has different meaning. Although non-linear regressions were obtained in the two studies described in this paper, only the regression of a vocabulary test on the T-F scale for high school boys seemed to change noticeably at the zero point of the Indicator scale. The meaning of this one regression may be limited since corresponding regressions of the vocabulary test on the T-F scale for high school girls and of SAT-V on the T-F scale for male Stanford University students were not significantly non-linear. These studies, as well as parallel studies by Myers, have been limited to academic variables; other kinds of variables should also be investigated.

This regression criterion has two limitations: (a) the variables which display such a regression cannot be identified on a priori grounds; and (b) no statistical test exists for determining the point at which any change in the regression occurs. However, as in the studies reported in this paper, non-linear regressions can be identified by the usual statistical test and then inspected for shifts at the zero point.

The interaction among the four dimensions which has such a central place in the typology, and largely distinguishes it from the usual trait approach, was not evident in the analysis of variance of intelligence and academic performance measures. Its operation in connection with other kinds of variables, particularly those from the personality sphere, should be investigated.[25]

The failure of the Indicator scales to have any moderator properties, with the possible exception of the T-F scale, implies that different patterns of surface traits are not associated with each type classification. The Indicator's moderator variable properties should be investigated further using other predictors and criteria and, perhaps, continuous Indicator scores instead of dichotomous type classifications.

Contrary to theoretical expectations, indeterminacy measures were unrelated to academic performance variables and personality measures, possibly because of ambiguities in the Indicator's measurement of type indeterminacy. Type indeterminacy, as it is measured by the Indicator, can be due to (a) lack of development of the two polarities, which corresponds to Jung's conception, and should have adverse consequences; or (b) equal development of both polarities, which is unrelated to Jung's conception of type indeterminacy and, rather than being undesirable, is the goal of individuation.

Overview. The procedures used in constructing the Indicator have made its meaning somewhat ambiguous. The precise meaning of its scales cannot be determined from the available data, but only the S-N and T-F scales seem largely consistent with their corresponding conceptual definitions.

While there is a certain amount of agreement between the Indicator scales and the conceptual definitions derived from the typology, the Indicator generally does not reflect the structural features of its underlying typological framework. This lack of correspondence may mean that the typology has no reality or it may only mean that the Indicator is unrelated to the typology. The typology can only be verified by further investigations which use a variety of techniques and measuring instruments.

Ability to Predict Important Variables

The Indicator does not seem very useful in the practical business of predicting socially important variables.

The Indicator may have some limited usefulness in academic settings. The Wesleyan and Cal. Tech. data suggest that it has some ability to predict grades and over-under achievement, if not dropouts, but probably only in liberal arts schools, and not engineering or technical schools. Even in liberal arts schools, however, its ability may not be great, either on an absolute basis or a relative basis (i.e., compared with the validity of three existing predictors--SAT-V, SAT-M, and high school rank). However, the use of the Indicator in addition to the usual predictors may slightly improve over-all prediction.

The Wesleyan and Cal. Tech. data also suggest that the Indicator generally does not act as a moderator variable in academic prediction, but the one positive finding--differences in the validities for Wesleyan students classified as thinking and feeling--is provocative.

The Indicator's moderator variable properties in this area, as well as others, should be explored more thoroughly.

The findings that several Indicator scales, especially E-I and S-N, discriminate among students in different high school programs and different kinds of colleges suggest that the Indicator may be useful in scholastic placement. This possibility needs to be investigated more systematically by studies which focus on the extent of the correlations and control confounding variables.

The ability of the Indicator to predict vocational criteria has not been examined thoroughly, but the available research is not very encouraging. One study suggests that the Indicator has no appreciable ability to predict turnover (two scales were slightly related to turnover, but these results seem limited largely to one of three employee subgroups). This study was also found that the Indicator could not differentiate between employees on different job assignments.

The Indicator seems to have rather limited ability to identify creativity. Only the S-N scale had even a moderate ability to differentiate between more and less creative members of the same occupation, and then only in one of three occupational groups.

Unique Contributions of the Indicator

Does the Indicator make any unique contributions to the armory of existing measuring instruments? Its attempt to measure theoretical constructs operationally sets it apart from most existing scales, but it is not a unique characteristic since other scales, such as the EPPS and the Study of Values, have the same goal and the Gray-Wheelwright Psychological Type Questionnaire even attempts to measure exactly the same Jungian variables. In any event, the linking of a test to a theory would only seem to be an advantage if the theory is fruitful, generally supported by the data, and the test, in fact, reflects the theory. A consideration of the fruitfulness of Jungian typology or even Myers' version of it is outside the scope of this paper. Concerning the last two issues, the available data can be interpreted as either not supporting the theory or implying that the Indicator does not reflect the theory, or both.

The extent to which the Indicator taps variables not already measured by other scales cannot be known until it is factor analyzed with common marker variables, such as the 16 P. F. The available data, however, suggest that the Indicator may not be measuring very much that is unique. Not surprisingly, the Indicator scales resemble those on the Gray-Wheelwright inventory. In addition, as noted earlier, the E-I, S-N, and J-P scales seem to be similar to existing scales. The T-F scale, however, does seem rather unlike existing scales.

Summary

The Myers-Briggs Type Indicator is a Jungian-oriented, self-report inventory which classifies people into dichotomous categories along each of four dimensions: extraversion-introversion, sensation-intuition, thinking-feeling, and judgment-perception.

The theory underlying this inventory, as well as relevant Jungian theory, the way that the Indicator was constructed, and intercorrelational, reliability, and validity studies were described and discussed in terms of their bearing on the correspondence between the typology formulated by Jung and Myers' version of it, and extent to which the Indicator actually reflects Myers' typology, the utility of the Indicator in predicting important variables, and any unique and potentially useful properties of the Indicator.

Appendix A

Norms

As an aid to interpretation of Indicator type classifications and continuous scores, normative data are presented for groups of high school, college, and graduate school students, a group of recently employed college graduates, and a group of public school teachers. Normative data are needed for other adult groups, especially those without college training. These results are based on virtually every member of each of these specified groups. All the students were required to take the Indicator, in a group administration, shortly after entering school--or during the term in the case of the high school students. Virtually all the group of recently employed college graduates were also required to take the Indicator.

Results are reported for each of these groups:

1. High School Students--results are reported separately for 146 boys in the college preparatory program, 230 boys in the general-vocational program, 148 girls in the college preparatory program, and 433 girls in the general-vocational program in eight academic and vocational high schools in Massachusetts. Students were tested when they were in the twelfth grade.

2. Male Liberal Arts College Students--results have been combined for the 258 Amherst, 821 Dartmouth, 844 Stanford, and 254 Wesleyan students in the Class of 1963.

3. Male Engineering School Students--results have been combined for the 201 California Institute of Technology, 515 Cornell College of

Engineering, 792 Massachusetts Institute of Technology, and 881 Rensselaer Polytechnic Institute students. The Cal. Tech. and RPI students were in the Class of 1962; the other two groups were from the Class of 1963.

4. Service Academy Students--results have been combined for the 1100-man Class of 1962 at two of the armed services academies.

5. Long Island University Students--results are presented separately for 300 male and 184 female students in the Class of 1963 at Long Island University.

6. Divinity School Students--results are presented for the 99 students entering Yale Divinity School in September, 1958.

7. Industrial Administration Students--results are presented for the 60 students entering the Graduate School of Industrial Administration at Carnegie Institute of Technology in September, 1958.

8. Recent College Graduate Appointees--results are presented for the 350 male college graduates, many with scientific or engineering training, hired by Westinghouse between June and August, 1959.

9. Public School Teachers--results are presented separately for 86 men and 248 women teaching in the elementary schools in Covina, California. They completed the Indicator (Form E) in December, 1958.

The results for each of these groups are presented separately. Table 55 reports the percentage of subjects in each of the 81 type categories and Table 56 reports percentile norms--the percentage of the group that lie below any given score--for continuous scores on each Indicator scale. Table 57 summarizes the percentage of students in each of the major type categories on each scale and Table 58 reports the means and standard deviations of the continuous scores on each scale.

Insert Tables 55-58 about here

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Footnotes

[1] The description in this paper of the Jungian attitudes and functions as dimensions or variables is not meant to imply that they are necessarily continuous, rather than dichotomous, in nature.

[2] In addition to those specifically cited in the text, the following people graciously furnished data used in this paper: Dr. William C. Craig of Stanford University, Mr. James W. Dean of Westinghouse Electric Corporation, Dr. Cyril M. Franks of the New Jersey Neuropsychiatric Institute, Mr. David W. Galloway of Golden Gate College, Mr. D. J. Gibson of Westinghouse Electric Corporation, Dr. Robert F. Grose of Amherst College, Dr. C. Hess Haagen of Wesleyan University, Dr. Thomas L.Hilton of Carnegie Institute of Technology, Dr. Clark W. Horton of Dartmouth College, Mr. David Keirsey of the Covina, California School District, Dr. Harold A. Korn of Stanford University, Mr. Joseph Marron, Mr. John F. Morse of Rensselaer Polytechnic Institute, Mr. Donald H. Moyer of Cornell University, Dr. John O. Nelson of Yale University, Mr. Douglas O. Pedersen of Rensselaer Polytechnic Institute, Mrs. Kathryn Pruden of Long Island University, Mr. John T. Rule of Massachusetts Institute of Technology, Dr. Rixford K. Snyder of Stanford University, Mr. John C. South of Westinghouse Electric Corporation, Dr. Ernest C. Tupes, and Dr. John T. Weir of California Institute of Technology.

[3] Unless otherwise indicated, the research described (a) involved Form F of the Indicator, (b) was conducted by the authors of this

paper, (c) was based on data collected between 1956 and 1961, and (d) used two-tailed tests of significance.

Normative data appear in Appendix A.

[4] This definition and the following ones are taken from the manuscript of a forthcoming publication by Myers, currently titled, Background for research on preference-type. Virtually identical definitions appear in Myers' earlier publications (Myers, 1945; Myers, 1958). These sources are also the basis of the general description of Myers' typology.

[5] Note that the abbreviation of Intuition is N; I is used as the abbreviation of Introversion.

[6] This section and the one that follows, as well as Table 1, are based on a personal communication from Myers, "Construction of the Indicator, Form Zero to F," (undated), and a series of personal interviews with her conducted by the senior author during the Fall and Winter of 1960 and the Spring of 1961. In addition, Myers' comments on the first draft of this paper were also adopted, insofar as they did not depart radically from the details reported in her memorandum and the interviews.

[7] A random sample of the larger group of 397 boys and 617 girls used in the intercorrelational, reliability, and normative studies described later.

[8] The reliability of the type categories cannot be estimated by the usual internal-consistency procedures because subparts of the total scale would not have meaningful zero points. The alternative weights,

which would determine the zero point, are not strictly applicable to part of a scale because they were partly chosen to set the zero point for the entire scale.

$\rho = \frac{m}{m - 1}(\alpha - \frac{1}{m})$, where m is the number of categories and α is the mean modal probability for the population (operationally, the sum of an item's largest subfrequencies in the contingency table of that item with any other item).

[9] $\kappa = \frac{P_o - P_c}{1 - P_c}$, where P_o is the proportion of observed agreement and P_c is the proportion of agreement expected by chance--that is, computed from the marginal frequencies. In a fourfold table, Kappa is equal to the Phi coefficient when the marginal frequencies are equal.

[10] Since the procedure used by Gray and Wheelwright for measuring J-P is not completely clear, no J-P measure was used in the study reported in this paper.

[11] A copy of this inventory and the scoring keys may be obtained from the senior author of this paper.

[12] As an example, the paragraph describing an ESTJ person was:

> Practical, realistic, matter-of-fact, with a natural head for business. Likes the mechanics of things. Not interested in subjects that he sees no actual use for, but can apply himself when necessary. Is good at organizing and running school activities, but sometimes rubs people the wrong way by ignoring their feelings and viewpoints.

The paragraph describing an INFP person was:

Particularly enthusiastic about books, reads or tells the parts he likes best to his friends. Interested and responsive in class, always attentive and quick to see what the teacher is leading up to. Has a warm, friendly personality but is not sociable just for the sake of sociability and seldom puts his mind on his possessions or physical surroundings.

[13] As an illustration, the fourfold table for ISTP was:

		Classification by Indicator	
		ISTP	Other
Classification	ISTP	16	67
By Peer	Other	109	1278

[14] All the statistical analyses for Wesleyan University are based on 225 students from the entire class of 254; scores on all variables, particularly the MMPI, were not available for the remaining 29 students.

[15] Students' class standings in high school (e.g., third in a class of 200) were transformed into standard scores with a mean of 13 and a standard deviation of 4, with high scores signifying high performance.

[16] Two minor analyses made by Laney--a comparison of those on sales and customer relations assignments with those on all other assignments, and an examination of type differences of those resigning to continue school and those resigning for other reasons--have not been reanalyzed and are not reported in this paper. Laney's investigation of "type suitability," which is particularly relevant

to a review of Myers' research, is described and extensively reanalyzed by Stricker (in preparation).

[17] Dr. Frances E. Dunn, Personal Communication. October, 1960.

[18] Dr. Irvin L. Child, Personal Communication. June 14, 1960 and January 14, 1961.

[19] MacKinnon suggests, on the basis of data provided by Myers, that the proportion of introverts in the general population is considerably smaller (25%) than in the various creative groups. The unavailability of adequate data about the type distributions in any clearly defined sample of the general population precludes an acceptable test of this hypothesis.

[20] These data were furnished by Dr. Donald W. MacKinnon.

[21] These data were furnished by Dr. Donald W. MacKinnon.

[22] The confidence intervals were estimated by:

$$P_{i+1} - P_i \pm Z_\alpha \sqrt{[P_{i+1} + P_i - (P_{i+1} - P_i)^2]/N}$$

where P_i is the proportion of cases in one class interval, and Z_α is the normal deviate above which lies $\alpha/2$ of cases in a normal distribution. Here $\alpha = 1 - .05/(k - 1)$ (where k is the number of intervals), so that the significance level of the entire procedure was conservatively set at a level equal to or less than .05.

[23] This issue was raised by Dr. Samuel Messick.

[24] The meaning of the PRI scales has never been specified and the scales are customarily identified by number. However, the names of these scales which were used in this paper for convenience, seem

roughly consistent with the scales' content, as it was judged by three psychologists (Saunders, 1955) and our examination of the items.

The "Talkativeness" scale was described as "Talkativeness," Insensitivity," and "Use of Speech to Control Guilt Feelings." Four representative items are:

9. Does your natural reserve generally stand in the way when you want to start a conversation with an attractive stranger of the opposite sex? (N)

116. Which do you do on social occasions? (Y)
    (Y) Readily come forward and speak.
    (N) Stay quietly in the background

144. Are you as likely to talk in a group of ten as in a group of two or three? (Y)

181. Which is more characteristic of your conversational skill? (N)
    (Y) Being a good listener.
    (N) Being a clear speaker.

The "Gregariousness" scale was described as "Gregariousness," "Social Participation," and "Value Being in a Crowd." Four representative items are:

24. To which of these would you like more prominent space given in newspapers? (N)
    (Y) Explorers.
    (N) Leading athletes and record breakers.

76. If you could do either equally well, which would you rather paint pictures of? (Y)
    (Y) Groups of people.
    (N) Landscapes without people in them.

126. Which kind of life would you prefer? (Y)

(Y) A YMCA (or YWCA) secretary.

(N) An artist.

198. Which would you prefer? (N)

(Y) To eat your lunch alone.

(N) To eat your lunch with a group of people.

The "Liking to Use Mind" scale was described as "Liking to Think," "Theoretical," and "Intellectual." Four representative items are:

40. Are you frequently surprised by the behavior of people whom you know well? (N)

88. Which part would you rather have in a play? (Y)

(Y) Adlai Stevenson

(N) Harry Truman

166. Are you inclined to analyze the motives of others? (Y)

195. Which would you rather be? (N)

(Y) A politician.

(N) A lawyer.

[25] Dr. David R. Saunders reports that he has completed an unpublished study which found that the Indicator dimensions interact and have moderator properties. Product scores derived from various combinations of the Indicator scales (e.g., E-I x S-N, E-I x S-N x T-F) had significant regressions coefficients in a regression equation composed of the four separate scales and product scores based on all their possible combinations. The criteria were Study of Values scores.

Table 1

Summary of Item Analyses of Indicator

	Subjects	Item Pool	Criterion[a]	Item Selection Index	Statistical Analyses	Designation of Resulting Form
1.	20 relatives	Behavior and value judgment items	Test authors' classification of type	60% or more agreement with criterion	Item retained if related to its variable's classification	O
2.	114 men and 110 women	Revised Form O items and new items (Forms A and B)	Form O scoring of items (+1,-1)	"	Separate item analyses for each sex. Items retained if related to own variable's classification and not highly related to other variables' classifications	Undesignated
3.	248 men, 268 women, 224 male and 70 female college students	Revised Form A and B items and one new item	Scoring with the Undesignated Form (+1,-1)	"	Same item analysis procedure used. Each group analyzed separately. Different keys derived for each group	C
4.	1000 men	Form C items	Form C scoring (+1,0,-1)	Proportion of each of two opposing type groups' responses to item in ratio of 2:3 or greater[b]	Separate item analyses for type subgroups (e.g., E-I items analyzed for -STJ, -SFJ, -SFP, -NTJ, -NJP, -NFJ, and -NFP groups) used as basis for over-all scoring	C3

Table 1 (Continued)

	Subjects	Item Pool	Criterion[a]	Item Selection Index	Statistical Analyses	Designation of Resulting Form
5.	120 men and women	Form C items (administered earlier), new behavior and value judgment items, and word pairs	Form C3 scoring (+2 to -2)	Proportion of each of two opposing type groups' responses to item in ratio of 2:3 or greater[b]	New items retained if related to own variable's classification and not highly related to other variables' classifications. Classifications based on original and not new items	--
6.	92 Yale Divinity School and 293 medical school students	Form C items, new behavior and value judgment items, and word pairs	(a) Form C3 scoring used in analyses of new items (+2 to -2) (b) Scoring of original and newly selected items used in analyses of these items	"	(a) New items tentatively retained if related to own variables' classification and not highly related to other variables' classifications. Classifications based on original and not new items (b) Newly selected items and original items retained if related to classification based on old and new items	D
7.	183 freshman and 179 graduate students at Wharton School	Form D items and new E-I and J-P word pairs	Form D scoring (+2 to -2)	--	Two groups compared to examine age effects. Results not used to change keys	--

Table 1 (Continued)

	Subjects	Item Pool	Criterion[a]	Item Selection Index	Statistical Analyses	Designation of Resulting Form
8.	77 Haverford and 392 Swarthmore high school students	Form D items with simplified wording and new E-I and J-P word pairs (Form D0)	Form D scoring ("unweighted" version: +1 to -1)	--	Two groups analyzed separately to examine effects of simplified wording. Results not used to change keys; items revised	--
9.	551 male and female Upper Darby high school students	Form D0 items revised (Form D1)	"	--	"	--
10.	4000 students from 27 Pennsylvania high schools	Form D1 items revised	Form D scoring ("unweighted" version: +1 to -1)	Proportion of two opposing type groups' responses to item in ratio of 2:3 or greater[b]	Answer sheets analyzed for approximately 200 boys and 200 girls in each of 16 types. Half of students in top of class, and intelligence of both halves similar. Except for T-F scale, resulting keys same for each sex	D2[c]

[a] Except in the test authors' classification of type, criterion groups for each scale were formed by comparing subjects from the upper and lower thirds of the scale.

[b] Alternatives with selection ratios of 1.5 to 2.2 were assigned weight of 1, and alternatives with higher ratios were assigned weights of 2.

[c] The Form D2 keys are exactly the same as the Form E and Form F keys.

Table 2

Similarity in Item Composition of Present and Earlier Forms of Indicator[a]

Indicator Form	Items Identical to Scored Form F Items				Other Items
	E-I	S-N	T-F	J-P	
Form E	22	26	23	24	14
Form D2	22	26	23	24	155
Form D	8	20	19	6	197
Form C	2	2	1	0	112
Number of Scored Form F Items	22	26	23	24	71[b]

[a] Not all the scored Form F items which appeared on Form C and Form D were necessarily scored on those forms.

[b] These items are retained for further scale development.

Table 3

Correlations Between Scores on Indicator Scales Based on Current and Simpler Item Weights for Pomona College Students

	Correlation with Scores Based on Current Item Weights			
	Scores Based on +1, 0, -1 Weights		Scores Based on +1, 0 Weights	
Scale	Men (N = 50)	Women (N = 50)	Men (N = 50)	Women (N = 50)
E-I	.995	.993	.978	.966
S-N	.997	.996	.984	.965
T-F				
Male Key	.991	.991	.947	.948
Female Key	.989	.995	.957	.962
J-P	.991	.987	.966	.970

Table 4

Median Item-Total Score Biserial Correlations

for High School Students

Items	Males (N = 395)	Females (N = 400)
	Correlation with E-I Total Score	
E-I items (N = 22)	.51	.55
All other items (N = 144)	.09	.10
	Correlation with S-N Total Score	
S-N items (N = 26)	.50	.48
All other items (N = 140)	.09	.11
	Correlation with T-F Total Score	
T-F items (N = 23)	.43	.46
All other items (N = 143)	.07	.09
	Correlation with J-P Total Score	
J-P items (N = 24)	.51	.55
All other items (N = 142)	.09	.12

Table 5

Items Most Highly Correlated with Total Scores on Their Scale in the High School Student Item Analysis

Biserial Correlation with Total Score			
Males (N = 395)	Females (N = 400)		Item[a]
			Extraversion-Introversion Scale
.86	.87	50.	Are you naturally (A) a "good mixer" (E2) (B) rather quiet and reserved in company (I2)
.69	.80	126.	Can you (A) talk easily to almost anyone for as long as you have to (E2) (B) find a lot to say only to certain people or under certain conditions (I2)
.52	.60	92.	(A) hearty (E1) (B) quiet (I2)
.57	.50	87.	(A) reserved (I1) (B) talkative (E2)
			Sensation-Intuition Scale
.71	.76	145.	Would you rather be considered (A) a practical person (S2) (B) an ingenious person (N2)
.67	.58	128.	If you were a teacher, would you rather teach (A) fact courses (S2) (B) courses involving theory (N2)
.60	.59	102.	(A) facts (S2) (B) ideas (N1)
.64	.53	73.	(A) imaginative (O) (B) matter-of-fact (S2)

Table 5 (Continued)

Biserial Correlation with Total Score			
Males (N = 395)	Females (N = 400)		Item[a]
			Thinking-Feeling Scale
.59	.54	154.	Do you more often let (A) your heart rule your head (F1) (F1) (B) your head rule your heart (T1) (T1)
.50	.61	26.	Are you inclined (A) to value sentiment above logic (F2) (F2) (B) to value logic above sentiment (T1) (T2)
.61	.68	105.	(A) justice (T2) (T2) (B) mercy (F2) (F2)
.56	.67	100.	(A) determined (T2) (T2) (B) devoted (F2) (F2)
			Judging-Perceiving Scale
.72	.71	1.	Does following a schedule (A) appeal to you (J2) (B) cramp you (P2)
.65	.70	132.	When there is a special job to be done, do you like (A) to organize it carefully before you start (J1) (B) to find out what is necessary as you go along (P2)
.83	.85	85.	(A) scheduled (J2) (B) unplanned (P2)
.64	.70	74.	(A) systematic (J2) (B) spontaneous (P2)

[a] Scoring weights appear after each alternative. There are different weights for males and females on the T-F items. The female weights are underscored.

Table 6

Phi Coefficient Intercorrelations Between Indicator Type Categories[a]

High School Students			
Males	S-N	T-F	J-P
E-I	-.02[b]	-.01[c]	.04[d]
S-N		.00[e]	.18[c]**
T-F			.13[g]
Females			
E-I	.05[h]	.03[i]	.03[j]
S-N		.07[k]	.21[e]**
T-F			.14[m]**
L.I.U. Students			
Males			
E-I	.08[n]	-.04[o]	.14[p]*
S-N		.07[q]	.23[r]**
T-F			.09[s]
Females			
E-I	-.03[t]	.05[u]	.13[v]
S-N		-.02[w]	.31[x]**
T-F			-.05[y]

*Significant at .05 level; **significant at .01 level.

[a] The numbers of male high school subjects used are: [b]368, [c]372, [d]374, [e]371, [f]372, [g]377, and female high school subjects used are: [h]580, [i]582, [j]576, [k]587, [l]583, [m]583. The numbers of male L.I.U. subjects used are: [n]287, [o]281, [p]290, [q]284, [r]293, [s]287, and female subjects are: [t]171, [u]177, [v]180, [w]170, [x]173, [y]179.

Table 7

Product-Moment Intercorrelations Between

Indicator Continuous Scale Scores

High School Students

Males (N = 397)	Mean	S.D.	S-N	T-F	J-P
E-I	3.32 (E)	11.66	-.10*	.03	.09
S-N	7.80 (S)	11.70		.02	.26**
T-F	.03 (T)	8.81			.12*
J-P	1.24 (J)	12.35			--
Females (N = 614)					
E-I	4.35 (E)	12.66	-.09*	-.02	.02
S-N	9.96 (S)	10.46		.10*	.33**
T-F	3.09 (F)	9.89			.20**
J-P	3.57 (J)	12.99			--

L.I.U. Students

Males (N = 300)	Mean	S.D.	S-N	T-F	J-P
E-I	4.88 (E)	11.15	.06	.03	.08
S-N	3.80 (S)	11.25		.02	.33**
T-F	2.40 (T)	9.84			.18**
J-P	3.40 (J)	14.26			--
Females (N = 184)					
E-I	7.10 (E)	11.32	-.14	.04	.01
S-N	6.27 (S)	12.17		.06	.47**
T-F	4.77 (F)	9.76			-.02
J-P	7.15 (J)	12.53			--

*Significant at .05 level; **significant at .01 level.

100

Table 8

Loadings of the Indicator and Study of Values on Orthogonal Factors Rotated to Define Indicator Scales for Amherst College and RPI Students

(N = 1132)[a]

Scale	Factor I	Factor II	Factor III	Factor IV
Indicator:				
E-I				
(1)	.79	-.03	-.03	.06
(2)	.76	.05	-.03	.02
(3)	.75	.01	.02	-.08
S-N				
(1)	.04	.80	.01	.00
(2)	-.04	.76	.06	.00
(3)	.02	.83	-.07	.00
T-F				
(1)	-.02	-.08	.78	.10
(2)	-.01	-.02	.71	.12
(3)	-.02	.12	.71	.00
J-P				
(1)	-.05	.30	.02	.76
(2)	.03	.22	.10	.78
(3)	.03	.20	.07	.76

Table 8 (Continued)

Scale	Factor			
	I	II	III	IV
Study of Values:				
Theoretical				
(1)	.05	.20	-.37	-.12
(2)	.06	.25	-.37	-.13
Economic				
(1)	-.11	-.42	-.13	.03
(2)	-.15	-.43	-.19	.02
Aesthetic				
(1)	.22	.30	.03	.09
(2)	.19	.33	.01	.04
Social				
(1)	-.11	-.09	.30	-.01
(2)	.06	-.05	.33	.01
Political				
(1)	-.06	-.08	-.22	.10
(2)	-.26	-.23	-.08	.14
Religious				
(1)	-.01	.07	.29	-.07
(2)	.08	.10	.28	-.09

[a] Factor loadings have been reflected so that factors have positive loadings on the Indicator scales that they define.

Table 9

Loadings of the Indicator, PRI, Interest-Information,
and Aptitude Test on Orthogonal Factors Rotated
to Define Indicator Scales for
Male High School Students[a]
(N = 722)

Scale	Factor			
	I	II	III	IV
Indicator:				
E-I	.67	-.02	-.01	.01
S-N	-.03	.61	-.04	.01
T-F	-.04	-.11	.45	.02
J-P	.18	.17	.10	.29
Factored Aptitude Tests:				
Vocabulary	-.03	-.47	.25	-.07
Arithmetic Reasoning	.08	-.33	.01	-.31
Paper Folding	.01	-.41	.00	-.10
Following Directions	-.09	-.42	.00	-.18
Tool Knowledge	-.08	-.20	.02	-.13
Letter Sets	.05	-.19	-.06	-.11
Sentence Completion	.02	-.37	.06	-.03
Word Number	.07	-.25	-.10	-.14
Social Judgment	.11	-.05	.14	-.08
Metaphors	.17	-.24	.10	.00
Arithmetic Speed	.01	-.08	.17	.05

Table 9 (Continued)

Scale	Factor I	II	III	IV
Cancellation	.10	-.42	.01	.11
Carefulness	.06	.09	.01	-.16
Hand Dexterity A	.10	-.20	.03	-.05
Hand Dexterity B	.02	-.17	.08	.27
Interest-Information Scales:				
Art and Music	-.09	-.17	.06	.08
Business	.04	-.25	.31	-.15
Literature	-.05	-.39	-.02	.01
Science	.00	-.49	.26	.03
Home Economics	.01	-.27	.02	.10
Athletics	.08	-.14	.00	-.28
Agriculture	.01	-.13	.02	.06
Personality Research Inventory:				
Free-Floating Anxiety	-.04	-.05	-.14	-.14
Impulsion	.23	-.11	.09	-.40
Altruism	-.01	.02	-.19	.30
Talkativeness	.62	-.03	.07	.12
Self-Sufficiency	-.21	-.21	.32	-.15
Gregariousness	.28	.37	-.07	-.18
Attitude to Work	.18	-.18	.14	.34
Masculinity-Femininity	-.12	.16	.25	-.25
Spiritualism-Materialism	.11	-.07	-.21	.11
Liking to Use Mind	.21	-.42	.16	.12

[a] Factor loadings have been reflected so that factors have positive loadings on the Indicator scales that they define.

Table 10

Internal Consistency Reliability of Type Categories[a]

	High School Students		L.I.U. Students	
Scale	Males (N = 397)	Females (N = 614)	Males (N = 300)	Female (N = 184)
E-I	.42	.46	.57	.60
S-N	.61	.73	.54	.55
T-F	.34	.43	.43	.50
J-P	.42	.45	.52	.59

[a] Reliability was estimated by Guttman's reliability formula for categorical data.

Table 11

Internal Consistency Reliability of Continuous Scores[a]

	High School Students		L.I.U. Students	
Scale	Males (N = 395)	Females (N = 400)	Males (N = 300)	Females (N = 184)
E-I	.78	.83	.76	.78
S-N	.77	.74	.75	.80
T-F	.64	.70	.74	.71
J-P	.78	.81	.84	.81

[a] Reliability was estimated by Coefficient Alpha.

Table 12

Type Classifications of Retested Amherst College Students and Their Classmates[a]

	Proportion in Each Type Classification		
Type Classification	Retested Students (N = 41)		Other Students (N = 217)
E	.44		.45
X	.05		.03
I	.51		.52
X^2		.51	
S	.32		.26
X	.00		.02
N	.68		.72
X^2		1.37	
T	.39		.43
X	.00		.07
F	.61		.50
X^2		3.72	
J	.49		.52
X	.05		.03
P	.46		.45
X^2		.61	

[a] None of the X^2 values are significant at the .05 level. Each X^2 is based on two degrees of freedom.

Table 13

Indicator Scores of Retested Amherst College Students and Their Classmates[a]

	Retested Students (N = 41)		Other Students (N = 217)			
Scale	Mean	S.D.	Mean	S.D.	F	t
E-I	1.17(E)	12.34	1.17(I)	12.90	1.09	1.07
S-N	3.95(N)	13.25	6.61(N)	12.48	1.13	1.24
T-F	.59(F)	9.51	1.11(F)	10.20	1.15	.31
J-P	1.95(J)	14.57	1.25(J)	13.57	1.15	.30

[a] None of the F tests of the variances or t tests of the means are significant at the .05 level.

Table 14

Agreement in Original and Retest Type Category of Amherst College Students (N = 41)

Scale	Proportion of Agreement Chance	Actual	Kappa
E-I	.47	.68	.40**
S-N	.58	.85	.65**
T-F	.50	.73	.46**
J-P	.48	.63	.30*

*Significant at .05 level; **significant at .01 level.

Table 15

Product-Moment Correlations Between Original and Retest Continuous Scores of Amherst College Students (N = 41)

Scale	Correlation
E-I	.73**
S-N	.69**
T-F	.48**
J-P	.69**

**Significant at .01 level.

Table 16

Phi Coefficient Intercorrelations Between Indicator and Gray-Wheelwright Type Categories for Male Golden Gate College Students (N = 47)[a]

	1	2	3	4	5	6	7
Indicator:							
1. E-I		.14	-.09	-.14	.63	-.24	-.06
2. S-N			-.20	.28	-.05	.34*	.18
3. T-F				.14	-.20	.03	.54**
4. J-P					-.06	.42**	.23
Gray-Wheelwright:							
5. E-I						-.19	-.03
6. S-N							.15
7. T-F							

*Significant at the .05 level; **significant at the .01 level.

[a] All correlations with the Indicator S-N scale are based on 45 subjects; all others are based on 47 subjects.

Table 17

Product-Moment Intercorrelations Between Indicator and Gray-Wheelwright Scores for Male Golden Gate College Students (N = 47)[a]

	1	2	3	4	5	6	7
Indicator:							
1. E-I	(.84)	-.07	-.22	-.11	.79**	-.24	-.20
2. S-N		(.62)	-.06	.44**	.00	.58**	.17
3. T-F			(.81)	.13	-.37**	.15	.60**
4. J-P				(.84)	-.17	.41**	.33*
Gray-Wheelwright:							
5. E-I					(.64)	-.27	-.25
6. S-N						(.58)	.22
7. T-F							(.30)

*Significant at the .05 level; **significant at the .01 level.

[a] Split-half reliability coefficients appear in the diagonals.

Table 18

Corrrelations of Indicator E-I Scale with Other Extraversion-Introversion Scales

Scale	Group	Correlation with Indicator E-I Scale
Extraversion Scale of Maudsley Personality Inventory:		
Regular Scale	52 female students at Trenton State Teachers College	.63**
20 item adaptation	22 male Yale University students	.64**
	22 male Stanford University students	.75**
Minnesota Multiphasic Personality Inventory:		
Si Scale	225 male Wesleyan University students	-.63**
Sc Scale	225 male Wesleyan University students	-.23**
Personality Research Inventory:		
Talkativeness Scale	722 male high school students[a]	.46**
	718 female high school students[a]	.53**
Gregariousness Scale	722 male high school students[a]	.18**
	718 female high school students[a]	.17**

**Significant at .01 level.

[a] Indicator administered two years after Personality Research Inventory.

Table 19

Agreement in Classification of 16 Types by
High School Peers and Indicator[a]

Type Combination	Proportion of Agreement		
	Chance	Actual	Phi
ISTP	.87	.88	.09**
ISTJ	.83	.84	.08**
ESTP	.90	.90	-.01
ESTJ	.82	.82	.00
ISFP	.89	.90	.08**
ISFJ	.89	.89	.04
ESFP	.88	.89	.07**
ESFJ	.84	.85	.09**
INTP	.89	.90	.10**
INTJ	.93	.93	.03
ENTP	.90	.90	-.03
ENTJ	.89	.90	.08**
INFP	.93	.93	-.01
INFJ	.94	.94	.03
ENFP	.89	.89	-.03
ENFJ	.90	.91	.02

**Significant at .01 level.

[a] The values for the Kappa coefficients are identical to those for the Phi coefficients.

Table 20

Agreement in Classification of the Four Basic Types by High School Peers and Indicator

	Proportion of Agreement		
Type	Chance	Actual	Kappa
E-I	.49	.56	.15**
S-N	.50	.57	.13**
T-F	.49	.55	.12**
J-P	.49	.52	.06*

*Significant at the .05 level; **significant at the .01 level.

Table 21

Correlations of Indicator Scales with Academic Criteria at
Wesleyan University and California Institute of Technology[a]

Wesleyan University (N = 225)

Scale	Mean	S.D.	G.P.A.	Over-Under Achievement	Dropout
E-I	2.38(E)	13.46	-.18**	-.09	--
S-N	4.76(N)	13.14	-.07	.04	--
T-F	.00(X)	10.44	-.01	-.05	--
J-P	1.72(P)	12.93	.24**	.27**	--

California Institute of Technology (N = 201)

E-I	3.94(I)	13.30	-.07	-.06	.02
S-N	13.77(N)	8.61	-.10	-.08	-.07
T-F	5.81(T)	9.91	.07	.05	.09
J-P	1.97(J)	14.35	.13	.14	.09

**Significant at .01 level.

[a] Means and standard deviations for the criteria are reported in Table 53.

Table 22

Multiple Correlations of Indicator Scales, SAT Scales, and High School Rank with Academic Criteria at Wesleyan University and California Institute of Technology

	Wesleyan University (N = 225)		California Institute of Technology (N = 201)		
Predictor Combinations	G.P.A.	Over-Under Achievement	G.P.A.	Over-Under Achievement	Dropout
Indicator Scales	.35**	.31**	.20	.19	.15
SAT Scales and H.S. Rank	.54**	.44**	.40**	.25**	.22*
Indicator Scales, SAT Scales, and H.S. Rank	.60**	.52**	.42**	.30**	.25

*Significant at the .05 level; **significant at the .01 level.

Table 23

Beta Weights of Indicator Scales, SAT Scales, and High School Class Rank for Prediction of Academic Criteria at Wesleyan University and California Institute of Technology

Wesleyan University (N = 225)

Predictor Combination	Beta Weights for Predictors						
	E-I	S-N	T-F	J-P	SAT-V	SAT-M	H.S. Rank
				GPA Criterion			
Indicator Scales	-.19	-.17	-.07	.31	--	--	--
SAT Scales and H.S. Rank	--	--	--	--	.21	-.02	.45
Indicator Scales, SAT Scales, and H.S. Rank	-.08	-.02	-.14	.25	.23	-.02	.43
				Over-Under Achievement Criterion			
Indicator Scales	-.11	-.05	-.13	.31	--	--	--
SAT Scales and H.S. Rank	--	--	--	--	-.03	-.15	.48
Indicator Scales, SAT Scales, and H.S. Rank	-.08	-.02	-.15	.27	-.01	-.15	.46

Table 23 (Continued)

California Institute of Technology (N = 201)

Predictor Combination	E-I	S-N	T-F	J-P	SAT-V	SAT-M	H.S. Rank
				Beta Weights for Predictors			
				GPA Criterion			
Indicator Scales	-.06	-.14	.03	.14	--	--	--
SAT Scales and H.S. Rank	--	--	--	--	.04	.27	.24
Indicator Scales, SAT Scales, and H.S. Rank	-.07	-.10	.00	.12	.03	.26	.23
				Over-Under Achievement Criterion			
Indicator Scales	-.05	-.12	.01	.16	--	--	--
SAT Scales and H.S. Rank	--	--	--	--	-.02	-.04	.25
Indicator Scales, SAT Scales, and H.S. Rank	-.07	-.11	-.01	.13	-.03	-.05	.24
				Dropout Criterion			
Indicator Scales	.04	-.09	.08	.09	--	--	--
SAT Scales and H.S. Rank	--	--	--	--	-.07	.19	.07
Indicator Scales, SAT Scales, and H.S. Rank	.03	-.08	.08	.07	-.07	.18	.05

Table 24

Type Classifications of Rockefeller Theological

Fellows Returning or Leaving Divinity School

Type Classification	Students Returning (N = 6)	Students Leaving (N = 7)
E	4	2
X	1	0
I	1	5
S	0	0
X	1	1
N	5	6
T	0	2
X	0	2
F	6	3
J	1	4
X	1	0
P	4	3

Table 25

Proportion of Employees Remaining in Each Type Classification[a]

Type Classifications	Clerical N	Clerical Proportion Remaining	Mechanical N	Mechanical Proportion Remaining	Other N	Other Proportion Remaining	Total N	Total Proportion Remaining
				Job Assignments				
E	65	.48	163	.64	93	.45	321	.55
I	21	.52	52	.50	37	.43	110	.48
χ^2	.14		3.14		.04		1.59	
S	87	.54	214	.64	124	.53	425	.59
N	19	.37	27	.37	32	.38	78	.37
χ^2	1.60		7.34**		2.52		12.22**	
T	50	.48	116	.62	66	.53	232	.56
F	30	.47	80	.60	64	.45	174	.52
χ^2	.01		.09		.77		.70	
J	67	.49	150	.67	90	.59	307	.61
P	26	.38	59	.49	44	.50	129	.47
χ^2	.88		5.95*		.95		6.88**	

*Significant at .05 level; **significant at .01 level.

[a] Each χ^2 is based on one degree of freedom.

Table 26

Proportion of Clerical Employees in Each Type Classification[a]

Type Classification	Number of Clerical and Mechanical Employees		Proportion Who are Clerical Employees
E	228		.28
I	73		.29
X^2		.00	
S	301		.29
N	46		.41
X^2		2.89	
T	166		.30
F	110		.27
X^2		.26	
J	217		.31
P	85		.30
X^2		.00	

[a] None of the X^2 values are significant at the .05 level. Each X^2 is based on one degree of freedom.

Table 27

Significant Over-all Differences in Mean Test Scores of Students in Twelve Type Categories[a]

Scale	Men (N = 603)	Women (N = 241)
SAT-V	x	x
SAT-M		x
Brown University Psychological Examination		
Concept Mastery Test	x	x
CEEB Achievement Test Average	x	
Iowa English Training Test		
Cooperative Reading Test:		
Level	x	
Vocabulary	x	x
Speed	x	x
Total	x	x
Cooperative Mathematics Test		x
Cooperative Natural Sciences Test	x	x
Cooperative Social Studies Test	x	x
Occupational Interest Inventory:		
Level of Interests	x	x
Arts	x	x
Business	x	x
Computational		x
Manipulative		x
Mechanical		x
Natural		
Personal-Social		x
Sciences		x
Verbal		x

[a] x indicates that difference was significant at .05 level or less by a one-way analysis of variance.

Table 28

Correlations Between Indicator and Study of Values Scales
for Amherst College and RPI Students (N = 1132)

	Indicator Scale											
	E-I			S-N			T-F			J-P		
Study of Values Scale	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Theoretical												
(1)	-.04	-.06*	-.05	-.17**	-.13**	-.18**	.27**	.34**	.24**	.04	.09**	.09**
(2)	-.06*	-.05	-.05	-.21**	-.15**	-.24**	.30**	.32**	.24**	.03	.08**	.07*
Economic												
(1)	.06*	.10**	.12**	.39**	.29**	.33**	.05	.08**	.17**	.11**	.06*	.09**
(2)	.08**	.12**	.16**	.40**	.31**	.32**	.08**	.11**	.23**	.13**	.07*	.10**
Aesthetic												
(1)	-.20**	-.15**	-.18**	-.29**	-.19**	-.25**	-.01	-.04	-.02	-.16**	-.14**	-.15**
(2)	-.14**	-.16**	-.16**	-.29**	-.23**	-.27**	.01	.00	-.04	-.15**	-.08**	-.11**
Social												
(1)	.11**	.10**	.06*	.07*	.05	.11**	-.23**	-.22**	-.20**	.00	.02	.02
(2)	-.04	-.03	-.07*	.02	.01	.07*	-.27**	-.25**	-.22**	-.01	-.03	-.02

Table 28 (Continued)

	Indicator Scale											
	E-I			S-N			T-F			J-P		
Study of Values Scale	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Political												
(1)	.07*	.03	.05	.04	.09**	.07*	.14**	.12**	.19**	-.03	-.06*	-.04
(2)	.18**	.20**	.23**	.17**	.19**	.21**	.03	.02	.08**	-.02	-.07*	-.04
Religious												
(1)	.03	.00	.01	-.04	-.08**	-.06*	-.17**	-.21**	-.28**	.03	.02	-.01
(2)	-.02	-.06*	-.10**	-.07*	-.11**	-.07*	-.15**	-.19**	-.28**	.03	.04	.01

*Significant at .05 level; **significant at .01 level.

Table 29

Correlations Between Indicator and Personality Research Inventory, Interest-Information, and Aptitude Tests for 722 Male and 718 Female High School Students

	Indicator Scale							
	E-I		S-N		T-F		J-P	
Scale	Male	Female	Male	Female	Male	Female	Male	Female
Factored Aptitude Tests:								
Vocabulary	.04	-.03	-.30**	-.39**	.13**	-.02	-.17**	-.16**
Arithmetic Reasoning	.03	.01	-.17**	-.22**	-.02	.00	-.13**	-.11**
Paper Folding	-.05	-.03	-.16**	-.25**	.06	-.06	-.10*	-.18**
Following Directions	.04	.04	-.27**	-.30**	.06	-.11**	-.16**	-.19**
Tool Knowledge	-.11**	-.09*	-.02	.00	.01	.07	-.03	-.04
Letter Set	.09*	.03	-.18**	-.14**	.08*	-.07	-.09*	-.06
Sentence Completion	.04	.02	-.13**	-.15**	.07	-.10*	-.04	-.05
Word Number	.08*	.09*	-.04	-.02	-.06	.01	-.06	-.03
Social Judgment	.07	.08*	-.01	.05	.08*	.05	-.01	.05
Metaphors	.12**	.07	-.08*	-.04	.07	.05	-.04	-.04
Arithmetic Speed	-.03	.05	-.04	.04	.05	.08*	.00	.08*

Table 29 (Continued)

	Indicator Scale							
	E-I		S-N		T-F		J-P	
Scale	Male	Female	Male	Female	Male	Female	Male	Female
Cancellation	.03	.11**	-.14**	-.11**	.07	-.02	-.06	-.06
Carefulness	.04	-.06	.04	-.04	.10*	-.07	.04	-.06
Hand Dexterity A	-.01	.06	-.05	-.06	.04	-.07	-.01	-.05
Hand Dexterity B	.10*	.05	-.07	.02	.05	.04	.00	.10*
Interest-Information Scales:								
Art and Music	.01	.01	-.16**	-.20**	.02	.02	-.08*	-.12**
Business	.05	.01	-.20**	-.22**	.09*	-.01	-.07	-.07
Literature	.03	-.06	-.25**	-.27**	.01	-.10*	-.12**	-.17**
Science	-.03	-.03	-.29**	-.19**	.11**	.04	-.08*	-.04
Home Economics	.05	-.04	-.19**	-.16**	.03	-.04	-.09*	-.08*
Athletics	.13**	.06	-.20**	-.22**	.02	.00	-.18**	-.18**
Agriculture	.00	-.01	-.12**	-.06	.04	.00	.00	-.05

Table 29 (Continued)

Scale	Indicator Scale							
	E-I		S-N		T-F		J-P	
	Male	Female	Male	Female	Male	Female	Male	Female
Personality Research Inventory:								
Free-Floating Anxiety	-.09*	-.13**	.00	.02	-.12**	-.13**	.00	.09*
Impulsion	.13**	.23**	-.11**	-.15**	.01	-.09*	-.15**	-.21**
Altruism	-.02	.06	.01	-.01	-.04	.00	.02	.00
Talkativeness	.46**	.53**	-.05	-.10*	.08*	.08*	.13**	-.05
Self-sufficiency	-.14**	-.18**	.07	-.10*	.14**	.15**	-.08*	-.07
Gregariousness	.18**	.17**	.18**	.26**	-.06	-.02	.04	.02
Attitude to Work	.13**	.13**	-.10*	-.09*	.07	.14**	.17**	.15**
Masculinity-Femininity	-.13**	-.02	.07	-.13**	.04	.03	-.06	-.16**
Spiritualism vs. Materialism	.13**	.07	-.07	-.02	-.04	-.17**	.06	.03
Liking to use Mind	.09*	.04	-.26**	-.31**	.08*	-.04	-.01	-.08*

*Significant at .05 level; **significant at .01 level.

Table 30

Means and Standard Deviations for Indicator, Personality Research Inventory, Interest-Information, and Aptitude Tests for 722 Male and 718 Female High School Students

	Males		Females	
Scale	Mean	S.D.	Mean	S.D.
Indicator:				
E-I	3.12(E)	11.75	3.90(E)	12.59
S-N	8.10(S)	11.08	9.28(S)	10.80
T-F	.08(F)	8.18	3.34(F)	9.39
J-P	1.63(J)	12.78	3.27(J)	12.78
Factored Aptitude Tests:				
Vocabulary	11.61	5.02	12.16	5.21
Arithmetic Reasoning	7.03	2.57	5.97	2.43
Paper Folding	5.09	2.24	4.59	2.14
Following Directions	9.00	2.46	9.34	2.53
Tool Knowledge	14.75	2.93	9.76	2.95
Letter Set	10.41	3.13	11.36	3.00
Sentence Completion	16.55	8.05	20.53	7.14
Word Number	8.55	4.76	8.57	4.49
Social Judgment	37.74	15.24	40.30	12.93
Metaphors	20.06	7.71	21.63	8.08
Arithmetic Speed	13.31	5.84	14.39	5.02
Cancellation	35.97	10.67	40.08	9.45
Carefulness	984.28	83.85	983.91	98.04
Hand Dexterity A	65.04	28.74	65.95	24.51
Hand Dexterity B	122.33	26.67	131.30	27.87

Table 30 (Continued)

Scale	Males Mean	Males S.D.	Females Mean	Females S.D.
Interest-Information Scales:				
Art and Music	5.30	2.11	5.53	2.16
Business	8.05	2.09	7.52	2.29
Literature	7.83	2.78	8.40	2.69
Science	7.08	2.59	6.44	2.27
Home Economics	6.16	2.11	8.85	2.13
Athletics	9.44	2.96	5.78	2.27
Agriculture	4.61	2.00	4.10	1.82
Personality Research Inventory:				
Free Floating Anxiety	7.36	4.09	9.29	4.64
Impulsion	10.34	2.90	10.32	3.14
Altruism	8.41	2.92	8.71	3.25
Talkativeness	9.78	4.37	9.56	4.64
Self-sufficiency	6.84	3.63	5.83	3.47
Gregariousness	11.03	3.09	11.80	3.32
Attitude to Work	11.77	3.58	12.01	3.73
Masculinity-Femininity	13.52	2.94	8.00	3.12
Spiritualism vs. Materialism	10.08	3.82	11.53	3.89
Liking to Use Mind	9.66	2.78	10.29	2.99

Table 31

Orthogonal Factor Loading of Indicator, Personality Research Inventory, Interest-Information, and Aptitude Tests for 722 Male and 718 Female High School Students[a]

Scale	I		II		III		IV		V		VI		VII		VIII		IX	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Factored Aptitude Tests:																		
Vocabulary	.76	.74																
Arithmetic Reasoning	.44	.49	.20						-.21								.32	.27
Paper Folding	.38	.57								.21					.32		.33	.21
Following Directions	.54	.63															.23	
Tool Knowledge												.21			.50	-.29		
Letter Set	.28	.45	.25	.26											-.24		.33	
Sentence Completion	.39	.21		.23			.20									-.26	.22	-.27
Word Number		.23	.26							.23		.27			-.20	-.20		
Social Judgment			.31	.34							.45	.46						
Metaphors			.43								.26	.44						.22
Arithmetic Speed			.54	.57											-.31			
Cancellation	.27		.65	.55														
Carefulness			-.24									-.40		-.24			.24	-.29
Hand Dexterity A			.46	.52														
Hand Dexterity B			.63	.67													-.20	
Interest-Information Scales:																		
Art and Music	.43									-.24				-.23				
Business	.50											.22	-.20	-.21				
Literature	.58															.23		-.27
Science	.65			-.22								.29			.23			-.20
Home Economics	.51															.21		-.28
Athletics	.38							-.26							-.38	-.21		
Agriculture	.35		-.21								.22	.23						
Personality Research Inventory:																		
Free-Floating Anxiety	-.20					-.24	.29			-.36	.27							
Impulsion					.20	.39			-.47	-.23								
Altruism									.37	.51								
Talkativeness					.68	.73												
Self-Sufficiency	.21				-.24			.31					-.29					
Gregariousness	-.23				.27			-.56							-.41			
Attitude to Work								.22	.27	.27			-.25	-.40			.25	
Masculinity-Femininity							-.41									-.43		
Spiritualism vs. Materialism				.27				.30								.30		
Liking to use Mind	.24	.23					.44	.31		.23			-.20					
Indicator:																		
E-I	-.03	-.08	.07	.08	.64	.77	.09	-.02	-.08	-.01	.09	.03	.02	.11	-.01	.08	.11	.02
S-N	-.38	-.46	-.24	.05	.02	-.11	-.33	-.39	.12	.08	.02	.06	.01	-.12	-.19	.02	-.07	-.05
T-F	.15	-.08	.07	-.01	-.02	-.01	-.01	.05	-.03	.02	.03	.17	-.42	-.42	.03	-.17	-.09	.09
J-P	-.13	-.34	.02	.14	.23	-.07	-.03	-.06	.25	.10	.00	.07	-.13	-.22	-.02	.27	-.07	-.14

[a] All factor loadings are reported for the Indicator scales, but only factor loadings above .20 are reported for the other scales. Signs of factor loadings for females have been reflected to conform to corresponding factor loadings for males.

Table 32

Correlations Between Indicator and SAT-V and SAT-M for Male Freshmen at California Institute of Technology (N = 201)[a]

	Indicator Scale			
Scale	E-I	S-N	T-F	J-P
SAT-V	-.11	-.20**	.12	-.17*
SAT-M	-.03	-.07	.05	.02

*Significant at .05 level; **significant at .01 level.

[a] Means and standard deviations of Indicator scales are reported in Table 21, and means and standard deviations of SAT scales are reported in Table 53.

Table 33

Correlations Between Indicator and EPPS, MMPI, Study of Values, and Aptitude and Achievement Tests for Male Freshmen at Wesleyan University (N = 225)[a]

			Indicator Scale			
Scale	Mean	S.D.	E-I	S-N	T-F	J-P
SAT-V	628.18	77.14	-.27**	-.34**	.10	-.08
SAT-M	656.04	75.92	-.20**	-.22**	.15*	.03
Concept Mastery Test	39.91	24.11	-.29**	-.28**	.09	.04
Brown-Holtzman Survey of Study Habits	40.45	10.44	.07	-.12	.20**	.31**
Davis Reading Test:						
Level	28.75	5.42	-.19**	-.33**	.02	-.08
Speed	48.17	12.25	-.16*	-.30**	.04	-.14*
Science Research Temperament Scale	19.40	6.94	.20**	-.45**	.06	-.36**
G-Z Aptitude Survey (General Reasoning)	17.74	4.83	-.17*	-.22**	.04	.06
Ship Destination Test	38.66	6.34	.04	.01	.04	.06
Study of Values:						
Theoretical	44.74	8.39	-.12	-.18**	.38**	.06
Economic	35.55	9.03	-.01	.52**	.25**	.13*
Aesthetic	39.59	10.49	-.17*	-.40**	-.05	-.22**
Social	35.04	8.01	.12	-.01	-.40**	-.02
Political	43.87	6.78	.11	.26**	.19**	.02
Religious	40.48	9.59	.13*	-.05	-.33**	.09

Table 33 (Continued)

			Indicator Scale			
Scale	Mean	S.D.	E-I	S-N	T-F	J-P
MMPI:						
N Elevated Scales	.71	1.22	-.28**	-.09	-.14*	-.24**
?	2.24	4.79	.04	-.11	-.08	.03
L	3.45	1.77	.12	-.06	.17*	.11
F	4.28	3.12	-.22**	.05	.03	-.24**
K	15.20	4.00	.23**	-.06	.13	.18**
Hs	12.31	2.81	-.10	.05	.01	-.03
D	16.99	4.71	-.39**	.06	-.05	-.10
Hy	20.07	3.48	.05	-.05	-.01	-.06
Pd	20.98	3.84	.08	-.11	-.12	-.23**
Mf	26.60	4.71	-.22**	-.33**	-.22**	-.17*
Pa	10.27	2.58	-.12	-.04	-.12	-.03
Pt	26.83	5.40	-.30**	.07	-.19**	-.13*
Sc	26.12	5.69	-.23**	-.03	-.07	-.17*
Ma	19.58	3.79	.29**	-.09	.06	-.16*
Si	21.63	8.86	-.63**	.06	-.02	-.10
Edwards S.D.	32.09	5.04	.38**	-.08	.19**	.19**
Balanced S.D.	21.79	2.99	.28**	-.03	.11	.19**
Balanced Acquiescence	14.38	2.47	.19**	-.06	-.06	-.06
EPPS:						
Ach	16.51	4.18	-.15*	-.16*	.20**	.01
Def	10.81	3.33	-.19**	.18**	.12	.21**
Ord	8.76	4.13	-.11	.36**	.25**	.53**

Table 33 (Continued)

			Indicator Scale			
Scale	Mean	S.D.	E-I	S-N	T-F	J-P
Exh	14.73	3.48	.21**	-.03	.06	-.23**
Aut	14.86	4.28	-.07	-.30**	.24**	-.30**
Aff	15.35	3.80	.16*	.05	-.38**	-.02
Int	16.88	4.68	-.05	-.12	-.02	.05
Suc	10.04	4.85	-.11	.11	-.27**	-.05
Dom	17.11	4.60	.31**	-.01	.21**	.12
Aba	13.72	5.28	-.20**	.11	-.23**	.00
Nur	13.14	5.04	.04	-.01	-.52**	-.07
Chg	14.90	4.83	.14*	-.12	.15*	-.21**
End	13.10	5.65	-.06	.06	.30**	.31**
Het	17.20	5.55	.10	-.06**	-.17*	-.20**
Agg	12.50	4.58	.00	-.06	.12	-.15*
Con	11.80	1.71	-.12	-.04	-.01	-.02

*Significant at .05 level; **significant at .01 level.

[a] Means and standard deviations of Indicator scales appear in Table 21.

Table 34

Correlations Between Indicator and Maudsley Personality Inventory and Christie Anxiety Scale for Female Students at Trenton State Teachers College (N = 52)

			Indicator Scale			
			E-I	S-N	T-F	J-P
Scale	M	S.D.	M = 6.08(E) S.D. = 12.52	M = 2.23(N) S.D. = 14.49	M = 3.65(F) S.D. = 9.46	M = 2.19(J) S.D. = 12.17
Maudsley Personality Inventory:						
Extraversion	30.21	8.63	.63**	-.29*	.19	-.05
Neuroticism	20.29	10.67	-.36**	.31*	-.29*	.06
Christie Anxiety Scale	20.04	6.27	-.24	.06	-.23	-.06

*Significant at .05 level; **significant at .01 level.

Table 35

Correlation Between Indicator, Aesthetic Judgment, and Personality Variables

for Male Students at Yale (N = 22) and Stanford (N = 22)

	Indicator Scale							
	E-I		S-N		T-F		J-P	
Variable	Yale	Stanford	Yale	Stanford	Yale	Stanford	Yale	Stanford
SAT-V	-.39	-.11	.11	.19	.05	-.23	.03	-.05
SAT-M	.23	-.36	-.18	-.22	.02	-.25	-.09	-.33
Viscerotonia	.62**	.20	-.07	-.01	.05	-.11	-.05	-.29
Somatotomia	.02	.41	-.25	.28	.00	.03	-.13	.48*
Extraversion	.64**	.75**	-.11	.03	-.16	.21	-.23	.29
Neuroticism	-.38	.21	.11	.10	.31	.42*	.48*	.24
Tolerance for Ambiguity	-.11	-.57**	.30	-.05	.21	-.16	.18	.07
Barron-Welsh Art Scale	-.44*	.02	.15	.47*	.10	.07	.23	.31
Rating on Responsiveness to Aesthetic Quality of Pictures	-.09	.17	.08	.24	-.08	.11	-.03	.41
Rating of Art Information	-.49*	.09	.03	.09	-.27	.04	-.03	.26
Bulley Test (Modified)	-.18	.23	.35	-.13	.01	.29	.27	.38

Table 35 (Continued)

	Indicator Scale							
	E-I		S-N		T-F		J-P	
Variable	Yale	Stanford	Yale	Stanford	Yale	Stanford	Yale	Stanford
Barron's Human Movement in Rorschach	-.14	.06	.12	.24	.06	-.10	.01	-.09
Preference for Poetic Sentences	-.05	.30	.05	.07	.43*	-.03	.14	.08
Preference for Paradoxical or Ambiguous Sentences	.13	-.21	-.12	.37	.35	-.05	-.19	-.02
Consistency in Aesthetic Judgments	-.23	.17	-.03	.27	.02	-.11	.38	.15
Length of Time Taken for Aesthetic Judgments	.32	-.27	.16	.05	.03	-.18	.12	.13

*Significant at .05 level; **significant at .01 level.

Table 36

Correlations Between Indicator and Strong Vocational Interest Blank Scales for Male Freshmen at Stanford University (N = 727)

	Indicator Scale			
	E-I	S-N	T-F	J-P
SVIB Scale	M = .17(E) S.D. = 12.76	M = 3.26(N) S.D. = 13.55	M = .70(T) S.D. = 10.79	M = 1.67(J) S.D. = 14.03
Group I				
1. Artist	-.26**	-.37**	-.03	-.20**
2. Psychologist (Rev.)	-.10*	-.55**	-.06	-.15**
3. Architect	-.29**	-.39**	.01	-.13**
4. Physician (Rev.)	-.14**	-.44**	-.07	-.13**
5. Osteopath	.01	-.22**	-.13**	-.08*
6. Dentist	-.24**	-.19**	.00	-.01
7. Veterinarian	.08*	.18**	-.07	.01
Group II				
8. Mathematician	-.37**	-.25**	.12**	.00
9. Physicist	-.35**	-.25**	.09*	-.01
10. Engineer	-.24**	-.12**	.18**	.05
11. Chemist	-.31**	-.28**	.09*	.01
Group III				
12. Production Manager	.11**	.15**	.20**	.14**

Table 36 (Continued)

SVIB Scale	Indicator Scale E-I	S-N	T-F	J-P
Group IV				
13. Farmer	-.17**	.15**	.02	-.02
14. Aviator	-.06	-.04	.06	-.11**
15. Carpenter	-.11**	.10*	.04	.08*
16. Printer	-.17**	-.12**	-.04	-.03
17. Math. Phys. Sci. Teacher	-.04	-.10*	-.03	.07
18. Ind. Arts Teacher	-.03	.03	.02	.06
19. Voc. Agricul. Teacher	.10*	.15**	-.09*	.02
20. Policeman	.17**	.13**	-.05	.07
21. Forest Service Man	.05	.02	-.02	-.02
Group V				
22. Y.M.C.A. Phys. Director	.35**	-.12**	-.20**	-.01
23. Personnel Director	.31**	-.14**	-.07	-.01
24. Public Administrator	.28**	-.21**	-.07	-.01
25. Y.M.C.A. Secretary	.32**	-.09*	-.19**	.02
26. Soc. Sci. H. S. Teacher	.24**	-.03	-.17**	.02
27. City School Sup't.	.26**	-.19**	-.18**	.03
28. Social Worker	.25**	-.29**	-.18**	-.07
29. Minister	.17**	-.31**	-.21**	-.04

Table 36 (Continued)

SVIB Scale	Indicator Scale E-I	S-N	T-F	J-P
Group VI				
30. Musician (Performer)	-.05	-.37**	-.16**	-.17**
Group VII				
31. C.P.A.	-.03	-.05	.13**	.06
Group VIII				
32. Senior C.P.A.	.04	.06	.10*	.09*
33. Accountant	.04	.29**	.15**	.24**
34. Office Man	.13**	.30**	-.02	.18**
35. Purchasing Agent	.11**	.49**	.22**	.22**
36. Banker	.09*	.51**	.09*	.23**
37. Mortician	.33**	.37**	-.09*	.10*
38. Pharmacist	.17**	.18**	.01	.09*
Group IX				
39. Sales Manager	.37**	.22**	.04	.03
40. Real Estate Salesman	.26**	.22**	-.02	-.08*
41. Life Insurance Salesman	.35**	.13**	-.14**	-.02

Table 36 (Continued)

SVIB Scale	Indicator Scale E-I	S-N	T-F	J-P
Group X				
42. Advertising Man	.10*	-.25**	-.11**	-.19**
43. Lawyer	.03	-.15**	-.06	-.12**
44. Author-Journalist	-.14**	-.29**	-.05	-.19**
Group XI				
45. President Mfg. Concern	.06	.16**	.17**	.09*
46. Interest Maturity	.20**	-.06	-.03	.09*
47. Occupational Level	-.01	-.06	.06	.04
48. Masculinity-Femininity	-.05	.17**	.22**	.03

*Significant at .05 level; **significant at .01 level.

Table 37

χ^2 Tests of Differences in Type Classifications for High School and L.I.U. Student Groups[a]

Scale	College Prep. Boys vs. Girls	General-Vocational Boys vs. Girls	College Prep. Boys vs. General-Vocational Boys	College Prep. Girls vs. General-Vocational Girls	L.I.U. Men vs. Women
E-I	2.11	2.54	8.38*	2.06	1.78
S-N	6.26*	4.69	52.02	27.01**	6.76*
T-F	19.11**	4.98	8.56*	2.20	34.35**
J-P	1.15	7.77*	.39	8.06*	3.45

*Significant at .05 level; **significant at .01 level.

[a] Each χ^2 is based on two degrees of freedom.

Table 38

t Tests of Differences in Mean Indicator Scores for High School and L.I.U. Student Groups

Scale	College Prep. Boys vs. Girls	General-Vocational Boys vs. Girls	College Prep. Boys vs. General-Vocational Boys	College Prep. Girls vs. General-Vocational Girls	L.I.U. Men vs. Women
E-I	.04	1.24	2.26*	1.25	2.11*
S-N	2.10*	1.16	7.55[a]**	7.06[a]**	2.27*
T-F	4.93**	2.64[a]**	2.72**	1.25	2.58*
J-P	.28	3.13**	.04	2.18*	3.03[a]**

*Significant at .05 level; **significant at .01 level.

[a] t test based on separate rather than pooled variances because variances were significantly different.

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Table 39

χ^2 Tests of Differences in Type Classifications for Various Student Groups[a]

Scale	College Prep. High School Boys vs. Liberal Arts College Men	College Prep. High School Boys vs. Engineering School Men	Liberal Arts College vs. Engineering School Men
E-I	16.88**	24.94**	15.97**
S-N	19.28**	31.60**	10.98**
T-F	4.91	10.02**	96.02**
J-P	.37	4.55	58.22**

**Significant at .01 level.

[a] Each χ^2 is based on two degrees of freedom.

Table 40

t Tests of Differences in Mean Indicator Scores for Various Student Groups

Scale	College Prep. High School Boys vs. Liberal Arts College Men	College Prep. High School Boys vs. Engineering School Men	Liberal Arts College vs. Engineering School Men
E-I	3.90[a]**	4.98[a]**	6.79**
S-N	4.61**	6.43**	4.31[a]**
T-F	1.08[a]	3.29[a]**	11.14[a]**
J-P	.29	2.87**	8.99**

*Significant at .05 level; **significant at .01 level.

[a] t tests based on separate rather than pooled variances because variances were significantly different.

Table 41

χ^2 Tests of Over-all Differences in Type Classifications

for Three Student Groups[a]

Group	N	Proportion Classified as Extraverts	N	Proportion Classified as Sensing	N	Proportion Classified as Thinking	N	Proportion Classified as Judging
Architects	13	.85	13	.08	13	.54	13	.31
Engineers	24	.25	26	.38	26	.65	26	.58
Medical	68	.43	68	.41	67	.52	67	.61
χ^2	12.28**		5.34		1.33		4.12	

**Significant at .01 level.

[a] Each χ^2 is based on two degrees of freedom.

Table 42

X^2 Tests of Differences in E-I Type Classification for Three Student Groups[a]

	Engineers	Medical
Architects	9.79**	6.10*
Engineers		1.65

*Significant at .05 level; **significant at .01 level.

[a] Each X^2 is based on one degree of freedom.

Table 43

Type Classifications of Students at Yale Divinity School

and Southern Baptist Seminary[a]

	Proportion in Each Type Classification		
Type Classification	Yale (N = 93)		Southern Baptist (N = 167)
E	.39		.60
X	.00		.03
I	.61		.37
X^2		15.52**	
S	.16		.72
X	.09		.03
N	.75		.25
X^2		73.69**	
T	.25		.07
X	.03		.01
F	.72		.92
X^2		17.64**	
J	.53		.63
X	.03		.04
P	.44		.33
X^2		2.85	

**Significant at .01 level.

[a] Each X^2 is based on two degrees of freedom.

Table 44

χ^2 Tests of Over-all Differences in Type Classifications for Four Creative Groups

Group	N	Proportion Classified as Extraverts	N	Proportion Classified as Sensing	N	Proportion Classified as Thinking	N	Proportion Classified as Judging
Writers	19	.31	20	.10	19	.31	20	.45
Architects	40	.35	40	.00	40	.50	39	.41
Research Scientists	45	.33	44	.05	44	.80	44	.64
Mathematicians	12	.33	11	.00	12	.75	11	.18
χ^2		.07		4.52		16.28**		9.05*

*Significant at .05 level; **significant at .01 level.

[a]Each χ^2 is based on three degrees of freedom.

Table 45

χ^2 Tests of Differences in T-F and J-P Type Classifications of Each Creative Group[a]

	Architects	Research Scientists	Mathematicians
		T-F Type Classifications	
Writers	1.10	11.41**	3.95*
Architects		6.84**	1.44
Research Scientists			.00
		J-P Type Classifications	
Writers	.00	1.27	1.21
Architects		3.38	1.08
Research Scientists			5.61*

*Significant at .05 level; **significant at .01 level.

[a] χ^2 values corrected for continuity. Each χ^2 is based on one degree of freedom.

Table 46

χ^2 Tests of Differences in Type Classifications of Creative Subjects and Other Subjects Within Three Groups[a]

Group	N	Proportion Classified as Extraverts	N	Proportion Classified as Sensing	N	Proportion Classified as Thinking	N	Proportion Classified as Judging
Creative Architects	40	.35	40	.00	40	.50	39	.41
Other Architects	41	.29	42	.14	43	.65	42	.55
χ^2		.10		4.24*		1.37		1.03
Creative College Women	10	.30	10	.10	10	.30	10	.30
Other College Women	15	.53	16	.00	16	.44	16	.31
χ^2		.55		.06		.08		.14
Creative Female Mathematicians	15	.20	15	.00	15	.53	15	.40
Other Female Mathematicians	25	.20	25	.12	26	.58	25	.68
χ^2		.17		.60		.00		1.97

*Significant at .05 level.

[a] χ^2 values corrected for continuity. Each χ^2 is based on one degree of freedom.

Table 47

Point Biserial Correlations Between Type Category and Age for Elementary School Teachers

	Men				Women			
	Age				Age			
Scale	N	Mean	S.D.	r	N	Mean	S.D.	r
E-I	81	32.56	7.15	-.01	236	35.33	11.48	.04
S-N	81	32.56	7.15	.03	235	35.62	11.58	-.17**
T-F	77	32.60	7.21	.17	230	35.53	11.38	.07
J-P	78	32.73	7.18	-.03	236	35.28	11.48	-.11

**Significant at .01 level.

Table 48

Differences in Relative Frequencies of Scores in Adjacent Intervals on each Indicator Scale for Male College Students

(N = 2297)

		Difference	
	Adjacent Score Intervals	Actual	Confidence Interval
		E-I Scale	
I	12 and 13 - 10 and 11	-.005	-.027 to +.016
	10 and 11 - 8 and 9	-.016	-.040 to +.006
	8 and 9 - 6 and 7	-.001	-.025 to +.024
	6 and 7 - 4 and 5	+.017	-.006 to +.040
	4 and 5 - 2 and 3	-.009	-.032 to +.013
	2 and 3 - X0 and I1	-.014	-.039 to +.010
	X0 and I1 - E1 and 2	+.024	.000 to +.048
E	1 and 2 - 3 and 4	+.002	-.019 to +.024
	3 and 4 - 5 and 6	-.009	-.031 to +.013
	5 and 6 - 7 and 8	+.016	-.005 to +.038
	7 and 8 - 9 and 10	+.012	-.007 to +.031
		S-N Scale	
N	10 and 11 - 8 and 9	-.007	-.030 to +.016
	8 and 9 - 6 and 7	-.007	-.030 to +.017
	6 and 7 - 4 and 5	-.006	-.031 to +.019
	4 and 5 - 2 and 3	+.003	-.022 to +.028
	2 and 3 - X0 and N1	+.016	-.008 to +.040
	X0 and N1 - S1 and 2	-.012	-.035 to +.012
S	1 and 2 - 3 and 4	+.002	-.022 to +.026
	3 and 4 - 5 and 6	+.012	-.011 to +.035
	5 and 6 - 7 and 8	+.011	-.010 to +.033
	7 and 8 - 9 and 10	+.015	-.004 to +.034
	9 and 10 - 11 and 12	+.007	-.011 to +.023

Table 48 (Continued)

		Difference	
	Adjacent Score Intervals	Actual	Confidence Interval
		T-F Scale	
F	11 and 12 - 9 and 10	-.003	-.021 to +.015
	9 and 10 - 7 and 8	-.011	-.030 to +.008
	7 and 8 - 5 and 6	-.023	-.045 to -.001
	5 and 6 - 3 and 4	-.013	-.037 to +.013
	3 and 4 - 1 and 2	+.006	-.020 to +.031
	1 and 2 - X0 and T1	-.009	-.035 to +.016
	X0 and T1 - 2 and 3	+.005	-.021 to +.030
T	2 and 3 - 4 and 5	+.013	-.011 to +.038
	4 and 5 - 6 and 7	+.010	-.013 to +.033
	6 and 7 - 8 and 9	+.005	-.017 to +.026
	8 and 9 - 10 and 11	+.021	-.002 to +.041
		J-P Scale	
P	7 and 8 - 5 and 6	-.006	-.030 to +.018
	5 and 6 - 3 and 4	+.005	-.019 to +.029
	3 and 4 - 1 and 2	-.001	-.025 to +.022
	1 and 2 - X0 and J1	.000	-.024 to +.024
	X0 and J1 - 2 and 3	-.004	-.028 to +.020
J	2 and 3 - 4 and 5	+.022	-.001 to +.045
	4 and 5 - 6 and 7	+.006	-.015 to +.027
	6 and 7 - 8 and 9	+.018	-.001 to +.037

Table 49

Significance of Non-Linear Regressions of Vocabulary and Arithmetic Reasoning Tests on Indicator Scales for Male and Female High School Students

	Males (N = 722)				Females (N = 718)			
Scale	k	r	η	F	k	r	η	F
				Vocabulary Test Regressions				
E-I	18	.03	.19	1.67*	18	-.02	.17	1.30
S-N	17	-.30	.36	2.08**	17	-.38	.42	1.88*
T-F	13	.12	.24	3.09**	14	-.02	.14	1.22
J-P	19	-.17	.26	1.66*	19	-.15	.24	1.54
				Arithmetic Reasoning Test Regressions				
E-I	18	.03	.10	.43	18	.02	.16	1.10
S-N	17	-.17	.20	.67	17	-.22	.27	1.34
T-F	13	-.02	.16	1.75*	14	.01	.15	1.35
J-P	19	-.13	.21	1.23	19	-.10	.23	1.73*

*Significant at .05 level; **significant at .01 level.

Table 50

Significance of Non-Linear Regressions of SAT-V, SAT-M, and GPA on Indicator Scales for Male Stanford University Freshmen (N = 828)

		Regressions								
		SAT-V			SAT-M			GPA		
Scale	*k*	*r*	*η*	*F*	*r*	*η*	*F*	*r*	*η*	*F*
E-I	18	-.13	.17	.65	-.14	.21	1.17	-.04	.11	.58
S-N	18	-.40	.44	2.16**	-.19	.24	1.07	-.13	.18	.76
T-F	17	-.02	.17	1.55	.08	.17	1.30	-.03	.22	2.69**
J-P	19	-.21	.25	.98	-.07	.17	1.14	.07	.13	.66

**Significant at .01 level.

Table 51

Analyses of Variance of SAT-V, SAT-M, GPA, and Over-Under Achievement for 160 Male Stanford University Freshmen

		SAT-V		SAT-M		GPA		Over-Under Achievement	
Source of Variation	df	Mean Square	F	Mean Square	F	Mean Square	F	Mean Square	F
E-I	1	127.806	3.11	108.900	2.03	2.756	-	23.256	-
S-N	1	1619.256	39.41**	378.225	7.06**	54.056	1.53	12.656	-
T-F	1	124.256	3.02	15.625	-	16.256	-	2.256	-
J-P	1	237.656	5.78*	225.625	4.21*	11.556	-	39.006	1.25
E-I x S-N	1	2.756	-	65.025	1.21	1.056	-	3.306	-
E-I x T-F	1	18.906	-	.225	-	51.756	1.47	35.156	1.13
E-I x J-P	1	37.056	-	27.225	-	85.556	2.43	63.756	2.04
S-N x T-F	1	3.906	-	40.000	-	.156	-	.506	-
S-N x J-P	1	120.756	2.94	32.400	-	3.306	-	4.556	-
T-F x J-P	1	26.406	-	4.900	-	24.806	-	18.906	-
E-I x S-N x T-F	1	6.806	-	22.500	-	26.406	-	28.056	-
E-I x S-N x J-P	1	10.506	-	44.100	-	29.756	-	43.056	1.38
E-I x T-F x J-P	1	15.006	-	84.100	1.57	7.656	-	16.256	-
S-N x T-F x J-P	1	61.256	1.49	180.625	3.37	20.306	-	31.506	1.01
E-I x S-N x T-F x J-P	1	113.906	2.77	30.625	-	.006	-	10.506	-
Within (error term)	144	41.087	-	53.540	-	35.237	-	31.195	-

*Significant at .05 level; **significant at .01 level.

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Table 52

Correlations of SAT Scales with Academic Criteria for Students in Different Indicator Type Classifications at Wesleyan University and California Institute of Technology[a]

Wesleyan University (N = 225)

		Correlation with GPA			Correlation with Over-Under Achievement		
Group	N	SAT-V	SAT-M	SAT-V and SAT-M[a]	SAT-V	SAT-M	SAT-V and SAT-M[a]
All Students	225	.33	.24	.35	.04	.03	.05
E Students	127	.27	.14	.27	-.02	-.09	.09
I Students	98	.28	.22	.32	.01	.03	.03
Difference	--	.01	.08	.05	.03	.12	.06
S Students	76	.32	.31	.38	.03	.09	.09
N Students	154	.32	.18	.33	.05	-.02	.06
Difference	--	.00	.13	.05	.02	.11	.03
T Students	116	.46	.38	.50	.18	.18	.22
F Students	112	.20	.11	.20	-.09	-.11	.12
Difference	--	.26*	.27*	.30	.27*	.29*	.10
J Students	100	.43	.37	.48	.09	.13	.14
P Students	126	.29	.16	.30	.01	-.06	.08
Difference	--	.14	.21*	.18	.08	.19	.06

Table 52 (Continued)

California Institute of Technology (N = 201)

Group	N	Correlation with GPA			Correlation with Over-Under Achievement			Correlation with Dropout		
		SAT-V	SAT-M	SAT-V and SAT-M[a]	SAT-V	SAT-M	SAT-V and SAT-M[a]	SAT-V	SAT-M	SAT-V and SAT-M[a]
All Students	201	.07	.31	.32	.00	.00	.00	-.05	.20	.20
E Students	76	.05	.26	.27	.02	-.11	.11	-.09	.17	.19
I Students	123	.06	.35	.35	-.04	.07	.08	-.03	.21	.22
Difference	--	.01	.09	.08	.06	.18	.03	.06	.04	.03
S Students	17	-.28	.53	.59	-.37	.29	.46	-.13	.49	.50
N Students	181	.11	.29	.31	.04	-.02	.04	-.05	.16	.17
Difference	--	.39	.24	.28	.41	.31	.42	.08	.33	.33
T Students	142	.09	.30	.32	.03	-.01	.03	.02	.16	.16
F Students	54	.00	.30	.30	-.10	.00	.10	-.20	.31	.39
Difference	--	.09	.00	.02	.13	.01	.07	.22	.15	.23
J Students	112	.18	.29	.33	.10	-.02	.10	.00	.16	.16
P Students	85	-.02	.34	.34	-.09	.01	.09	-.07	.23	.25
Difference	--	.20	.05	.01	.19	.03	.01	.07	.07	.09

*Significant at .05 level.

[a] Differences in these corresponding multiple correlations were not tested for significance.

Table 53

Means and Standard Deviations for SAT Scales and Academic Criteria

for Students in Different Indicator Type Categories

at Wesleyan University and California Institute of Technology[a]

Wesleyan University (N = 225)

	SAT-V		SAT-M		GPA		Over-Under Achievement	
Group	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
All Students	628.18	77.14	656.04	75.92	81.02	6.24	200.04	58.43
E Students	609.29	79.78	640.71	75.33	79.68	6.36	191.97	61.41
I Students	652.96	66.98	677.24	72.21	82.78	5.67	210.62	53.75
S Students	602.24	76.67	638.03	76.37	80.64	6.17	203.09	57.45
N Students	640.58	73.61	665.45	74.68	81.25	6.26	199.08	59.19
T Students	636.47	77.35	665.52	70.57	81.56	6.09	202.91	53.71
F Students	622.32	77.10	647.77	81.98	80.55	6.37	197.30	62.96
J Students	620.60	84.67	655.50	78.80	82.66	5.68	217.99	50.25
P Students	637.38	70.62	655.32	76.47	80.02	6.13	188.43	58.73

Table 53 (Continued)

California Institute of Technology (N = 201)

	SAT-V		SAT-M		GPA		Over-Under Achievement		Freshman Dropout	
Group	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
All Students	668.21	64.56	753.89	39.60	2.74	.63	201.83	59.02	.89	.32
E Students	662.26	69.45	750.91	43.75	2.67	.58	196.39	56.53	.87	.34
I Students	671.20	61.20	755.16	36.76	2.78	.65	205.11	59.72	.89	.31
S Students	652.59	79.21	749.18	33.70	2.56	.62	187.06	56.55	.76	.42
N Students	669.47	63.29	754.37	40.16	2.76	.64	203.83	59.26	.89	.31
T Students	672.37	64.80	754.33	41.86	2.76	.67	203.17	61.64	.89	.31
F Students	656.30	64.14	752.20	33.38	2.67	.55	195.98	52.86	.87	.34
J Students	661.46	66.04	755.25	38.16	2.83	.63	210.91	58.14	.91	.28
P Students	677.89	61.35	752.35	42.06	2.62	.63	190.07	59.34	.85	.36

[a] The number of students in each group is reported in Table 52

Table 54

Correlations of Indicator Type Indeterminacy Measures
with Academic Criteria at Wesleyan University
and California Institute of Technology

Wesleyan University (N = 225)

	Indeterminacy Measure		Correlations with Criteria	
Variable	Mean	SD	GPA	Over-Under Achievement
	Dichotomous Indeterminacy Measure			
E-I	.96	.18	-.06	-.05
S-N	.99	.11	-.03	-.02
T-F	.97	.17	-.05	-.06
J-P	.96	.20	.06	.07
	Continuous Indeterminacy Measure			
E-I	11.52	7.30	-.05	.00
S-N	12.04	7.09	.12	.07
T-F	8.48	6.10	-.05	-.05
J-P	10.84	7.27	-.04	-.03

Table 54 (Continued)

California Institute of Technology (N = 201)

	Indeterminacy Measure		Correlation with Criteria		
Variable	Mean	SD	GPA	Over-Under Achievement	Dropout
		Dichotomous Indeterminacy Measure			
E-I	.99	.10	-.04	-.01	-.03
S-N	.99	.10	.08	.09	-.03
T-F	.99	.12	-.10	-.09	-.04
J-P	.98	.14	.02	.01	-.05
		Continuous Indeterminacy Measure			
E-I	11.82	7.27	.08	.09	.03
S-N	14.49	7.32	.10	.08	.07
T-F	9.78	6.03	.09	.05	.03
J-P	12.16	7.80	.05	.07	.03

Table 55

Correlation Between Indicator Type Indeterminacy Measures and MMPI Scales for Wesleyan University Students (N = 225)

	Indeterminacy Measure							
	Dichotomous				Continuous			
MMPI Scale	E-I	S-N	T-F	J-P	E-I	S-N	T-F	J-P
?	.02	.05	.05	-.24**	-.05	-.08	-.09	-.16*
L	.01	-.06	-.04	-.11	.07	-.05	-.03	-.15*
F	-.03	-.01	.00	-.03	-.04	.00	.09	.13
K	-.04	-.04	-.10	.14*	-.06	.01	-.06	-.05
Hs	.03	.05	-.01	-.01	-.02	-.06	.04	.03
D	.02	-.01	.00	-.02	-.05	.04	.03	.05
Hy	-.04	.05	.03	.00	.03	.03	.13	.00
Pd	-.02	.02	.09	.06	-.01	.01	.08	.13*
Mf	-.04	.10	-.05	-.06	-.02	.10	-.03	.00
Pa	-.03	.15*	.02	-.05	.05	-.05	-.03	-.12
Pt	.01	.00	.10	-.05	-.04	-.09	.04	.02
Sc	.01	.04	.02	.05	-.01	-.04	.09	.09
Ma	-.01	-.05	.06	-.05	-.04	-.15*	.06	.05
Si	.06	.07	.07	-.04	.01	.08	-.03	.07
N Elevated Scales	-.01	.07	.06	.04	.02	.06	.04	.06

*Significant at .05 level; **significant at .01 level.

Table 56. Percentage of Subjects in Each Type Classification[a]

a. Male High School Students in the College Preparatory Program (N = 146)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		5.5 ISTJ		4.8 ISFJ		2.7 INFJ		4.8 INTJ	
IX				.7					
IP		4.1 ISTP		2.1 ISFP		1.4 INFP		3.4 INTP	
XP		.7		1.4	.7	.7		1.4	
EP		6.2 ESTP		4.8 ESFP	.7	6.8 ENFP	.7	7.5 ENTP	
EX				1.4					
EJ		13.0 ESTJ		8.9 ESFJ	.7	4.8 ENFJ		7.5 ENTJ	1.4
XJ		.7		.7					

b. Male High School Students in the General-Vocational Program (N = 230)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		11.3 ISTJ		8.3 ISFJ	.4	INFJ		INTJ	
IX									
IP	.4	5.7 ISTP	.4	7.0 ISFP	2.2	3.5 INFP		.9 INTP	
XP		.4		.4					
EP		7.4 ESTP	1.3	10.9 ESFP	.9	3.0 ENFP	.4	.4 ENTP	.4
EX		.4		1.3					
EJ		14.8 ESTJ	1.7	13.0 ESFJ	.4	.4 ENFJ		1.3 ENTJ	
XJ		.4		.4					

[a] Percentages may not add exactly to 100.0 because of rounding errors. Cells in which the percentage is 0.0 have been left blank.

Table 56 (Continued)

c. **Female High School Students in the College Preparatory Program (N = 148)**

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		2.0 ISTJ		6.8 ISFJ		1.4 INFJ		2.0 INTJ	
IX		.7				.7		.7	
IP		2.0 ISTP		4.7 ISFP	.7	4.1 INFP		3.4 INTP	.7
XP				.7					
EP		3.4 ESTP		17.6 ESFP		8.8 ENFP	1.4	.7 ENTP	
EX				.7					
EJ		11.5 ESTJ	.7	16.2 ESFJ	.7	3.4 ENFJ		2.0 ENTJ	.7
XJ		1.4		.7					

d. **Female High School Students in the General-Vocational Program (N = 433)**

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		8.5 ISTJ	.2	10.9 ISFJ		1.6 INFJ		.5 INTJ	
IX		.2		.5		.2			
IP		3.5 ISTP	.2	6.9 ISFP		1.6 INFP	.2	.5 INTP	
XP		.2		.7				.2	
EP		5.3 ESTP		11.1 ESFP	.9	2.1 ENFP		1.2 ENTP	.2
EX		.2		1.6				.2	
EJ		15.5 ESTJ	1.2	18.2 ESFJ	.5	2.1 ENFJ	.2	.2 ENTJ	.2
XJ		.9	.2	1.2					

Table 56 (Continued)

e. Male L.I.U. Students (N = 300)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		6.7 ISTJ	.7	3.7 ISFJ		1.3 INFJ	.3	2.3 INTJ	
IX				.3				.3	
IP		3.3 ISTP	.3	2.3 ISFP		2.3 INFP	.7	4.7 INTP	
XP		.3		.7				.3	
EP		7.3 ESTP	1.0	4.7 ESFP		6.7 ENFP		3.7 ENTP	.3
EX									
EJ		21.0 ESTJ		11.0 ESFJ	.7	4.0 ENFJ	.7	6.3 ENTJ	.7
XJ		.3		.7				.3	

f. Female L.I.U. Students (N = 184)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		3.3 ISTJ		8.7 ISFJ	1.1	1.6 INFJ		INTJ	
IX									
IP		2.7 ISTP		2.7 ISFP		3.8 INFP		1.1 INTP	
XP									
EP		2.7 ESTP		6.0 ESFP	1.6	5.4 ENFP		4.3 ENTP	
EX		.5							
EJ		13.0 ESTJ	1.6	24.5 ESFJ	2.7	6.5 ENFJ	.5	3.8 ENTJ	
XJ				1.1				.5	

Table 56 (Continued)

g. Male Liberal Arts College Students (N = 2177)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		6.6 ISTJ	.3	3.9 ISFJ	.3	5.3 INFJ	.5	6.2 INTJ	.4
IX		.2		.2		.4		.3	
IP		2.1 ISTP	.2	2.0 ISFP		7.4 INFP	.6	6.7 INTP	.1
XP		.3		.1		.5		.4	
EP		2.5 ESTP	.2	3.8 ESFP	.2	9.6 ENFP	.9	6.6 ENTP	.3
EX		.2		.2		.3		.5	
EJ		8.6 ESTJ	.4	5.3 ESFJ	.2	6.0 ENFJ	.4	7.1 ENTJ	.4
XJ		.3		.2		.2		.2	

h. Male Engineering School Students (N = 2389)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		9.0 ISTJ	.4	3.5 ISFJ	.1	4.9 INFJ	.4	13.4 INTJ	.4
IX		.2		.3		.3		.4	
IP		1.6 ISTP	.2	1.5 ISFP	.1	4.4 INFP	.5	7.7 INTP	.3
XP		.1		.1		.3		.4	
EP		2.5 ESTP	.2	1.1 ESFP	.1	5.6 ENFP	.8	6.2 ENTP	.2
EX		.2		.1		.2		.4	
EJ		8.0 ESTJ	.3	3.0 ESFJ	.2	5.8 ENFJ	.9	11.3 ENTJ	.7
XJ		.3		.4		.3		.7	

Table 56 (Continued)

i. **Male** Service Academy Students (N = 1110)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ	.1	11.1 ISTJ	.2	2.7 ISFJ	.3	2.0 INFJ	.2	6.5 INTJ	.5
IX		.5		.1		.2			
IP		1.4 ISTP		1.3 ISFP	.1	2.2 INFP	.2	3.0 INTP	.1
XP		.1		.1		.3		.3	.2
EP		2.6 ESTP		1.5 ESFP	.1	5.9 ENFP	.3	5.0 ENTP	.1
EX		.5		.3		.4		.4	
EJ		19.8 ESTJ	.4	5.9 ESFJ	.1	5.6 ENFJ	.5	14.4 ENTJ	.8
XJ		1.2		.3	.1	.2		.5	

j. **Male** Graduate Students in Industrial Administration (N = 60)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		8.3 ISTJ		6.7 ISFJ		INFJ		13.3 INTJ	
IX								1.7	
IP		3.3 ISTP		ISFP		1.7 INFP		8.3 INTP	
XP		1.7							
EP		ESTP		ESFP		1.7 ENFP		3.3 ENTP	
EX									
EJ		15.0 ESTJ		5.0 ESFJ		5.0 ENFJ	1.7	18.3 ENTJ	5.0
XJ									

Table 56 (Continued)

k. Male Graduate Students in Theology (N = 99)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		1.0 ISTJ		6.1 ISFJ	1.0	19.2 INFJ	2.0	10.1 INTJ	
IX						1.0			
IP		ISTP		ISFP		5.1 INFP	1.0	3.0 INTP	
XP						1.0			
EP		ESTP		ESFP		6.1 ENFP		ENTP	
EX						1.0			
EJ		2.0 ESTJ		9.1 ESFJ		21.2 ENFJ	1.0	8.1 ENTJ	
XJ						1.0			

l. Male College Graduate Appointees (N = 350)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		7.7 ISTJ	.6	2.0 ISFJ		2.3 INFJ	.3	8.0 INTJ	.6
IX		.6				.3			
IP		3.1 ISTP		.6 ISFP		.6 INFP	.3	4.0 INTP	
XP		.3				.3			
EP		2.6 ESTP	.3	2.0 ESFP		2.3 ENFP	.3	7.1 ENTP	.6
EX		.3	.3					.6	
EJ		21.4 ESTJ	1.4	4.6 ESFJ	.6	1.7 ENFJ	.6	18.0 ENTJ	.9
XJ		1.7		.3	.3			.9	

Table 56 (Continued)

m. Male Public School Teachers (N = 86)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX									
IJ		9.3 ISTJ		8.1 ISFJ		1.2 INFJ	1.2	5.8 INTJ	1.2
IX		2.3						1.2	
IP		1.2 ISTP		ISFP		2.3 INFP		1.2 INTP	
XP									
EP		2.3 ESTP		2.3 ESFP	1.2	4.7 ENFP		1.2 ENTP	
EX								1.2	
EJ		14.0 ESTJ	3.5	9.3 ESFJ		10.5 ENFJ	1.2	12.8 ENTJ	
XJ				1.2					

n. Female Public School Teachers (N = 248)

	XX	ST	SX	SF	XF	NF	NX	NT	XT
XX						.4			
IJ		5.2 ISTJ	.8	11.7 ISFJ	.8	3.2 INFJ	.8	1.6 INTJ	
IX				.4					
IP		1.2 ISTP		2.4 ISFP		6.5 INFP		2.4 INTP	
XP									
EP		1.6 ESTP		7.7 ESFP	.4	6.0 ENFP	.8	3.6 ENTP	
EX				.4		.8			
EJ		8.1 ESTJ	1.6	13.3 ESFJ	.4	6.0 ENFJ	.4	8.5 ENTJ	.8
XJ			.4	1.2					

Table 57

Percentile Distributions of Continuous Scores[a]

A. E-I Scale

	High School Students				College Students					Male Grad. Students				
	Male		Female											
					L.I.U.		Male					Male Coll.	Public School Teachers	
Score	Coll. Prep	Gen. Vocat.	Coll. Prep	Gen. Vocat.	Male	Female	Lib. Arts	Male Engr.	Serv. Acad.	Ind. Admin.	Theol.	Grad. Appointees	Male	Female
E 27	99		99		99	99	99	99	99			97		99
26	99	99	97	99	98	98	99	99	98		99	97	98	99
25	97	99	97	98	98	97	99	99	97		99	96	98	99
24	96	98	97	97	98	96	98	98	96		99	94	95	98
23	96	98	95	95	98	92	97	97	94	98	96	92	94	98
22	94	97	91	94	97	90	96	96	91	98	96	90	94	97
21	92	96	87	92	96	88	94	95	89	97	96	87	92	94
20	89	93	83	90	93	85	93	94	86	95	92	83	91	92
19	86	92	82	88	91	82	91	92	84	92	92	80	90	90
18	85	90	82	86	88	77	89	91	81	87	91	78	85	89
17	82	88	78	83	85	76	87	89	79	85	91	75	85	87
16	75	87	75	80	83	73	85	87	75	85	90	73	83	85
15	73	84	73	77	79	71	83	85	72	83	86	72	79	83
14	70	80	69	75	75	68	80	83	70	80	82	69	77	80
13	67	76	65	72	70	66	77	81	68	75	80	67	73	79
12	65	73	61	69	66	63	75	79	65	75	77	66	72	75
11	62	70	59	66	63	59	72	76	62	73	74	63	67	71
10	60	68	59	64	60	55	69	74	60	70	71	59	67	65
9	59	65	54	60	56	53	67	71	57	67	68	57	64	63
8	57	63	51	58	53	49	64	69	54	62	65	53	63	60
7	55	59	49	53	51	45	61	67	52	57	62	50	62	57
6	53	55	48	50	48	42	59	64	49	55	61	48	59	54
5	50	53	47	48	45	40	57	62	46	53	59	46	56	53
4	46	51	44	46	43	36	54	60	43	53	58	42	51	51
3	42	48	41	44	39	33	51	58	41	50	57	40	43	46
2	40	46	36	41	36	28	49	55	38	48	55	37	40	42
E 1	36	42	32	39	32	27	46	52	36	47	52	35	36	40
X 0	29	40	30	36	29	25	44	50	32	45	49	31	35	38
I 1	27	37	29	34	28	21	41	47	29	43	48	30	33	37
2	25	35	28	31	25	20	39	45	27	38	46	27	30	35
3	23	33	28	30	23	18	36	42	25	32	41	25	28	32
4	22	30	26	29	21	15	34	40	23	30	39	24	26	30
5	19	27	25	27	19	14	32	38	21	30	33	21	24	28
6	15	26	22	24	17	12	29	35	19	30	31	20	22	27
7	13	24	18	21	16	10	27	32	18	25	30	17	21	27
8	12	22	16	19	13	10	25	29	16	20	30	15	20	24
9	10	20	16	18	11	8	23	27	14	20	27	14	20	21
10	9	16	13	16	10	7	21	25	12	17	26	13	20	18
11	8	14	12	13	10	7	19	23	10	12	24	11	20	17
12	8	12	11	11	8	5	16	20	8	12	23	11	17	14
13	6	10	9	10	7	4	14	18	7	10	22	9	16	12
14	5	9	8	10	6	4	12	16	6	10	21	9	12	10
15	4	9	8	8	5	3	11	14	5	10	17	7	10	8
16	4	7	7	7	4	3	10	12	5	8	14	6	9	6
17	3	6	5	6	4	2	9	11	4	8	10	5	8	5
18	3	4	4	5	3	1	7	9	3	5	8	5	7	5
19	1	2	3	3	3	1	6	7	3	5	6	3	5	4
20	1	2	2	3	2	1	5	6	2	3	4	3	5	3
21	1	2	2	2	1	1	4	5	2	3	3	2	5	2
22	1	1	2	2	1	1	3	4	1	2	1	1	3	2
23	1		1	1	1	1	2	3	1		1	1	1	2
24	1		1	1		1	1	2	1			1	1	1
25			1	1		1	1	1				1	1	1
26			1	1				1				1	1	1
27			1										1	
28														
I 29														

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[a]The number of subjects in each group is reported in Table 56.

Table 57 (Continued)

B. S-N Scale

Score	High School Students				College Students					Male Grad. Students				
	Male		Female		L.I.U.								Public School Teachers	
	Coll. Prep	Gen. Vocat.	Coll. Prep	Gen. Vocat.	Male	Female	Male Lib. Arts	Male Engr.	Serv. Acad.	Ind. Admin.	Theol.	Male Coll. Grad. Appointees	Male	Female
S 34														
33						99								
32			99			99								99
31			99	99		99			99				99	99
30			99	99		98			99			99	98	98
29		99	99	98		97	99		99			99	98	97
28		97	99	98		96	99		99		99	98	98	96
27	99	97	99	96		95	98	99	99	98	99	98	93	96
26	99	96	99	95	99	94	98	99	98	98	99	97	92	94
25	98	93	98	93	99	91	97	98	97	95	99	96	91	94
24	97	90	97	92	98	91	96	98	96	95	99	95	90	92
23	94	88	96	89	97	90	96	98	95	95	99	95	90	92
22	92	87	95	86	96	87	95	97	94	95	99	94	88	91
21	90	84	93	82	94	85	94	97	92	95	99	93	88	90
20	89	81	92	77	93	84	93	96	91	95	98	90	87	88
19	88	79	89	73	91	83	92	95	90	92	98	89	87	85
18	86	74	89	70	90	80	91	94	88	92	98	87	85	85
17	85	70	86	65	87	78	90	93	87	92	98	86	84	83
16	84	67	85	59	86	76	89	92	85	83	98	84	84	83
15	82	62	82	54	82	74	88	91	84	80	97	83	84	81
14	80	56	78	50	79	70	86	90	82	80	97	82	79	77
13	77	52	76	46	78	68	85	89	80	80	97	79	72	75
12	75	49	73	42	75	66	84	87	78	78	96	75	70	73
11	72	47	69	38	71	63	82	85	77	78	94	72	69	71
10	71	43	66	36	67	60	81	84	74	77	94	71	67	70
9	69	38	59	31	62	58	79	83	71	75	94	69	64	68
8	67	33	57	29	58	54	77	81	68	75	94	67	62	64
7	65	28	52	27	55	51	75	80	66	72	94	66	60	60
6	63	24	49	25	50	48	73	78	63	67	91	63	56	58
5	60	23	45	23	46	46	71	76	62	63	88	61	56	56
4	56	20	39	20	45	42	69	74	59	62	87	59	55	52
3	53	18	36	17	41	41	66	71	55	62	86	57	51	48
2	49	16	36	14	38	38	64	69	52	62	85	52	48	46
S 1	45	15	31	13	36	33	62	67	50	60	82	50	47	44
X 0	42	10	28	11	34	28	60	65	48	55	81	47	44	42
N 1	37	9	24	8	32	24	58	63	45	53	79	45	40	38
2	34	7	22	7	29	24	56	61	43	52	75	43	38	36
3	34	7	20	6	26	21	53	58	40	48	72	42	36	33
4	31	6	17	6	24	21	51	56	37	43	70	40	36	33
5	29	4	16	5	22	19	49	53	35	42	67	37	30	29
6	27	3	14	4	20	17	45	50	33	38	63	34	29	27
7	25	3	14	3	16	15	43	48	30	37	59	32	28	27
8	23	2	11	3	15	13	40	46	28	33	51	27	27	25
9	21	2	10	2	14	12	37	43	26	27	47	24	26	21
10	19	2	10	2	12	10	35	40	24	22	46	21	23	19
11	16	1	10	2	11	9	33	37	22	22	43	20	20	16
12	14	1	9	1	9	7	30	34	20	18	40	18	16	14
13	12	1	8	1	8	6	27	31	18	17	34	15	14	12
14	11	1	7		7	4	25	28	16	13	34	13	13	9
15	10	1	6		6	2	23	25	13	10	30	11	10	8
16	8	1	5		5	2	20	22	10	7	23	10	10	6
17	5		4		5	2	18	19	8	5	23	7	8	6
18	5		3		4	2	15	16	6	3	18	5	7	5
19	3		3		3	1	13	14	5	3	16	4	3	4
20	3		3		2		10	11	3	2	10	3	3	1
21	2		2		2		7	8	3	2	7	2	2	1
22	1		1		1		5	5	2		4	1		1
23	1						3	3	1		1	1		1
24	1						2	2	1		1	1		1
N 25														

Table 57 (Continued)

C. T-F Scale

Score	High School Students				College Students					Male Grad. Students				
	Male		Female		L.I.U.								Public School Teachers	
	Coll. Prep	Gen. Vocat.	Coll. Prep	Gen. Vocat.	Male	Female	Male Lib. Arts	Male Engr.	Serv. Acad.	Ind. Admin.	Theol.	Male Coll. Grad. Appointees	Male	Female
T 31	-	-			-		-	-	-	-	-	-	-	
30	-	-			-		-	-	-	-	-	-	-	
29	-	-			-		-	-	-	-	-	-	-	
28	-	-			-		-	-	-	-	-	-	-	
27	-	-			-		-	-	-	-	-	-	-	
26	-	-			-	99	-	-	-	-	-	-	-	
25	-	-		99	-	99	-	-	-	-	-	-	-	99
24			99	99		99		99		98				99
23			99	99		98	99	98	99	97				99
22	99		99	99	99	98	99	97	98	95		98		98
21	98		99	99	98	98	98	96	97	95		96		98
20	97		99	99	98	98	97	94	94	87	99	94		98
19	97		99	99	96	98	96	93	92	85	98	91	99	98
18	97	99	99	99	94	98	94	91	90	83	96	88	99	98
17	97	99	99	98	92	98	93	88	87	78	96	84	97	98
16	95	99	98	96	90	98	91	86	84	70	95	80	94	97
15	94	97	96	97	89	97	89	84	82	63	95	76	94	95
14	92	96	95	96	87	97	87	82	78	60	94	71	88	95
13	90	95	94	95	84	97	85	79	74	57	94	65	86	94
12	88	93	92	94	82	95	83	75	71	53	93	61	83	91
11	84	93	92	93	80	95	80	72	68	48	93	57	78	89
10	81	91	88	91	75	94	78	68	64	47	91	52	78	87
9	77	87	86	90	70	91	75	64	61	43	91	47	74	85
8	71	85	84	87	68	90	72	60	57	40	89	43	72	83
7	66	82	83	83	63	88	69	57	53	38	88	37	66	81
6	60	80	81	79	57	85	65	53	48	35	85	34	64	78
5	58	75	79	77	53	83	63	49	45	32	82	31	60	77
4	55	70	77	72	51	80	60	46	40	28	79	28	55	75
3	52	65	74	69	47	77	57	43	37	28	79	26	52	72
2	51	60	71	66	44	70	54	39	35	27	77	24	50	70
T 1	44	57	69	62	42	68	50	36	31	22	76	22	47	67
X 0	43	52	67	60	38	66	46	32	29	20	72	18	41	62
F 1	40	47	63	56	34	61	43	30	27	18	69	15	37	60
2	37	43	59	52	32	59	39	27	24	15	62	13	34	57
3	31	39	57	47	27	54	36	24	21	13	57	12	30	53
4	30	35	53	44	24	51	32	21	18	8	53	10	26	51
5	23	31	48	41	21	48	30	18	16	7	49	8	23	49
6	19	27	45	36	19	45	26	16	14	2	45	7	20	46
7	18	23	42	34	18	42	24	14	13		40	6	17	43
8	16	20	38	30	16	36	21	13	12		39	5	15	39
9	13	17	35	26	13	34	19	11	10		38	4	13	35
10	11	15	31	24	12	31	17	9	8		33	3	9	31
11	10	10	28	22	10	28	15	8	7		32	3	8	28
12	8	7	22	19	7	26	13	7	6		26	1	6	26
13	6	6	20	16	6	22	12	6	5		23	1	6	20
14	5	6	16	15	4	20	10	5	4		16	1	6	18
15	5	4	16	11	4	15	9	4	3		12	1	3	15
16	3	2	11	9	3	14	7	3	3		12	1	3	12
17	3	2	5	6	2	10	6	3	2		11	1	3	8
18	2	2	3	5	2	8	4	2	2		8	1	3	6
19		1	3	4	1	5	3	1	1		5	1	3	4
20		1	1	3	1	4	2	1	1		5	1		
21		1	1	2	1	3	1	1	1		2	1		3
22				1	1	2	1	1			2			2
23					1	1	1				1			
24														
F 25			-	-		-								-

Table 57 (Continued)

D. J-P Scale

Score	High School Students				College Students					Male Grad. Students		Male Coll. Grad. Appointees	Public School Teachers	
	Male		Female		L.I.U.		Male							
	Coll. Prep	Gen. Vocat.	Coll. Prep	Gen. Vocat.	Male	Female	Lib. Arts	Male Engr.	Serv. Acad.	Ind. Admin.	Theol.		Male	Female
J 28				99		99			99	98		99		98
27	99		99	99	99	96	99	99	98	98	99	99		96
26	99	99	98	99	98	95	99	98	96	98	96	97	99	96
25	97	99	98	98	97	95	98	96	94	95	96	95	97	94
24	97	99	98	97	96	91	97	94	91	92	90	91	93	92
23	95	99	95	95	94	88	95	92	87	88	88	89	90	89
22	95	98	92	93	91	84	93	91	85	85	85	86	87	85
21	95	97	91	91	88	83	91	88	82	80	81	83	85	82
20	95	96	89	89	86	81	89	86	79	78	79	79	81	81
19	92	94	86	86	85	79	88	83	75	72	76	76	79	79
18	90	93	82	84	81	77	86	81	72	67	72	73	78	77
17	89	91	78	82	79	72	84	77	68	63	67	70	73	73
16	87	88	77	79	76	70	83	75	65	62	64	65	71	69
15	85	86	76	76	73	67	81	73	62	62	59	61	71	67
14	83	83	75	73	71	64	79	69	58	60	56	59	64	65
13	79	78	74	69	67	62	76	67	55	58	53	56	63	60
12	77	76	72	67	65	60	74	64	52	53	52	52	58	58
11	75	73	70	63	62	54	72	61	50	52	51	50	55	57
10	71	70	66	61	60	53	70	58	47	48	46	47	49	55
9	68	69	64	58	57	51	68	56	44	45	45	44	44	54
8	64	65	63	57	54	49	65	53	40	40	45	43	41	51
7	60	61	58	55	52	46	62	51	37	38	40	39	40	48
6	57	58	58	52	48	45	60	49	36	35	37	37	36	47
5	56	56	57	50	45	41	57	46	33	32	31	34	34	44
4	53	53	55	46	42	39	55	44	31	28	30	33	33	40
3	49	51	53	43	41	36	52	41	30	27	27	30	28	38
2	47	50	51	41	40	35	50	38	28	25	22	29	24	36
J 1	45	47	51	38	39	31	47	36	27	22	18	26	21	35
K 0	42	46	48	35	39	30	45	34	25	20	16	24	16	33
P 1	40	43	43	33	37	26	43	32	22	17	16	23	15	32
2	37	41	41	30	35	23	40	30	20	15	14	20	15	29
3	36	37	39	27	34	21	39	28	18	15	12	17	15	28
4	33	32	36	25	33	19	36	26	17	15	11	17	13	25
5	30	30	35	22	31	17	34	24	16	13	10	15	13	24
6	29	29	34	20	28	14	32	23	15	12	10	15	12	21
7	29	27	26	17	25	13	30	21	14	12	9	13	12	18
8	26	24	24	15	24	10	28	20	12	8	9	12	10	17
9	26	21	24	15	22	9	26	18	11	8	8	10	9	15
10	23	20	22	13	20	9	25	17	10	8	7	9	9	14
11	20	17	20	12	18	8	22	15	9	8	7	8	8	11
12	18	13	17	10	17	7	20	13	8	8	7	7	7	10
13	18	12	16	10	16	5	18	12	8	8	5	7	6	9
14	16	11	14	9	13	4	16	11	7	8	4	7	6	8
15	14	11	13	8	12	4	14	10	6	8	3	6	5	6
16	11	10	11	6	12	4	13	9	6	8	2	6	2	5
17	9	7	10	6	10	3	11	8	5	8	2	5	2	5
18	7	6	8	5	9	2	10	7	4	7	2	5	2	4
19	4	4	6	4	8	2	9	6	3	5	1	4	1	4
20	4	4	5	3	7	2	7	5	2	5	1	4	1	3
21	3	3	5	2	6	2	6	4	2	5	1	3		3
22	3	3	3	2	5	2	6	3	2	3	1	3		2
23	3	3	2	1	3	2	4	3	1	2	1	2		1
24	1	1	2	1	3	1	3	2	1	2	1	1		1
25	1	1	1	1	1	1	3	2	1	2	1	1		
26			1		1	1	2	1	1			1		
27			1		1	1	2	1				1		
28			1		1	1	1					1		
29														
30														
31														
P 32														

Table 58

Percentage of Subjects in Each Major Type Classification[a]

Group	E	X	1	S	X	N	T	X	F	J	X	P
High School Students:												
Male Coll. Prep.	64.4	6.2	29.5	54.8	3.4	41.8	56.2	.7	43.2	55.5	2.1	42.5
Male Gen'l-Vocat.	58.3	1.7	40.0	85.2	4.8	10.0	43.5	4.3	52.2	52.6	1.7	45.7
Female Coll. Prep.	67.6	2.7	29.7	68.9	2.7	28.4	31.1	2.0	66.9	49.3	2.7	48.0
Female Gen'l-Vocat.	61.0	3.5	35.6	87.3	1.8	10.9	37.6	2.3	60.0	62.1	3.0	34.9
College Students:												
L.I.U.												
Male	68.0	2.7	29.3	64.3	1.7	34.0	58.0	3.7	38.3	60.7	.7	38.7
Female	73.4	1.6	25.0	66.8	5.4	27.7	32.1	2.2	65.8	69.0	.5	30.4
Male Lib. Arts	53.9	2.4	43.7	37.6	2.2	60.3	49.9	3.7	46.3	53.0	2.4	44.6
Male Engr.	47.6	2.8	49.6	32.9	2.2	64.8	64.0	3.8	32.2	64.1	2.0	33.9
Service Academy	64.4	3.2	32.4	49.8	2.4	47.7	68.8	1.7	29.5	73.2	2.3	24.5
Male Graduate Students:												
Ind'l Admin.	55.0	1.7	43.3	40.0	5.0	55.0	78.3	1.7	20.0	78.3	1.7	20.0
Theology	48.5	2.0	49.5	18.2	1.0	80.8	24.2	4.0	71.7	81.8	2.0	16.2
Male College Grad. Appointees	65.4	3.7	30.9	49.7	2.9	47.4	78.3	4.0	17.7	73.7	2.0	24.3
Public School Teachers:												
Male	64.0	1.2	34.9	53.5	2.3	44.2	53.5	5.8	40.7	79.1	4.7	16.3
Female	60.5	2.4	37.1	56.0	2.4	41.5	33.1	4.8	62.1	64.9	2.0	33.1

[a] The number of subjects in each group is reported in Table 56.

Table 59

Means and Standard Deviations of Indicator Scores[a]

Group	E-I Mean	E-I S.D.	S-N Mean	S-N S.D.	T-F Mean	T-F S.D.	J-P Mean	J-P S.D.
High School Students:								
Male Coll. Prep.	5.25(E)	11.46	2.04(S)	12.54	1.34(T)	9.24	1.20(J)	12.82
Male Gen'l.-Vocat.	2.46(E)	11.77	11.13(S)	9.28	1.12(F)	8.17	1.15(J)	12.05
Female Coll. Prep.	5.20(E)	12.82	4.92(S)	10.95	4.16(F)	9.88	1.64(J)	13.84
Female Gen'l.-Vocat.	3.69(E)	12.51	12.02(S)	9.36	3.00(F)	9.65	4.28(J)	12.37
College Students:								
L.I.U.								
Male	4.88(E)	11.15	3.80(S)	11.25	2.40(T)	9.84	3.40(J)	14.26
Female	7.10(E)	11.32	6.27(S)	12.17	4.77(F)	9.76	7.15(J)	12.53
Male Lib. Arts	1.39(E)	12.73	3.29(N)	13.59	.48(T)	10.75	.85(J)	13.94
Male Engr.	.34(I)	12.96	4.98(N)	12.82	3.95(T)	10.26	4.51(J)	13.57
Service Academy	5.24(E)	12.23	.50(S)	13.04	4.88(T)	10.06	8.33(J)	12.80
Male Graduate Students:								
Ind'l. Admin.	1.97(E)	11.97	.45(N)	12.42	9.07(T)	8.77	8.67(J)	12.87
Theology	.02(I)	12.99	8.52(N)	10.25	5.02(F)	10.01	9.33(J)	11.52
Male Coll. Grad. Appointees	5.40(E)	12.83	.88(S)	13.08	7.86(T)	8.64	8.10(J)	12.78

Table 59 (Continued)

	Indicator Scale							
	E-I		S-N		T-F		J-P	
Group	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Public School Teachers								
Male	2.86(E)	12.89	2.46(S)	13.91	1.56(T)	9.25	8.28(J)	11.24
Female	2.48(E)	12.22	2.80(S)	13.18	3.88(F)	10.61	6.00(J)	13.52

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[a] The number of subjects in each group is reported in Table 56.

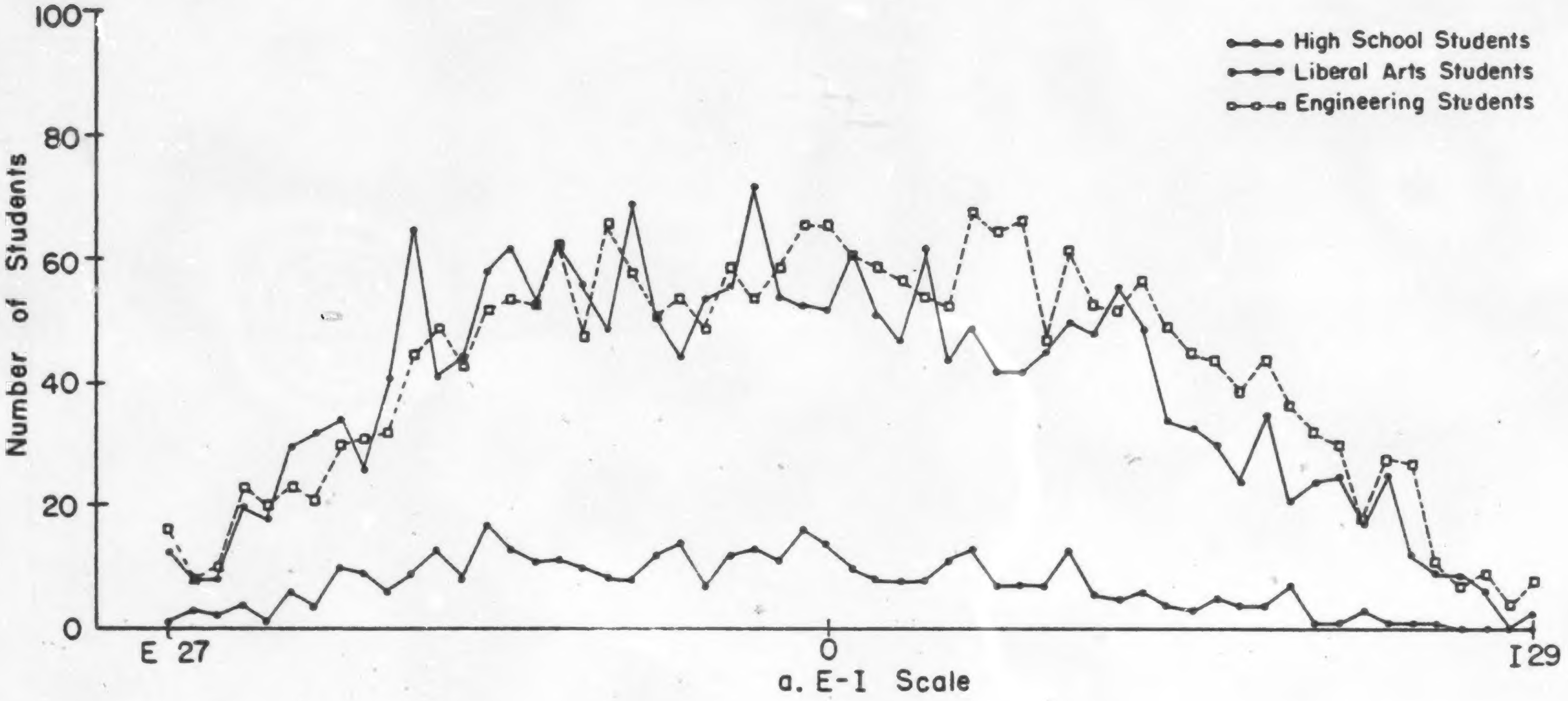


Fig. 1. Distribution of Indicator Scores for Three Student Groups

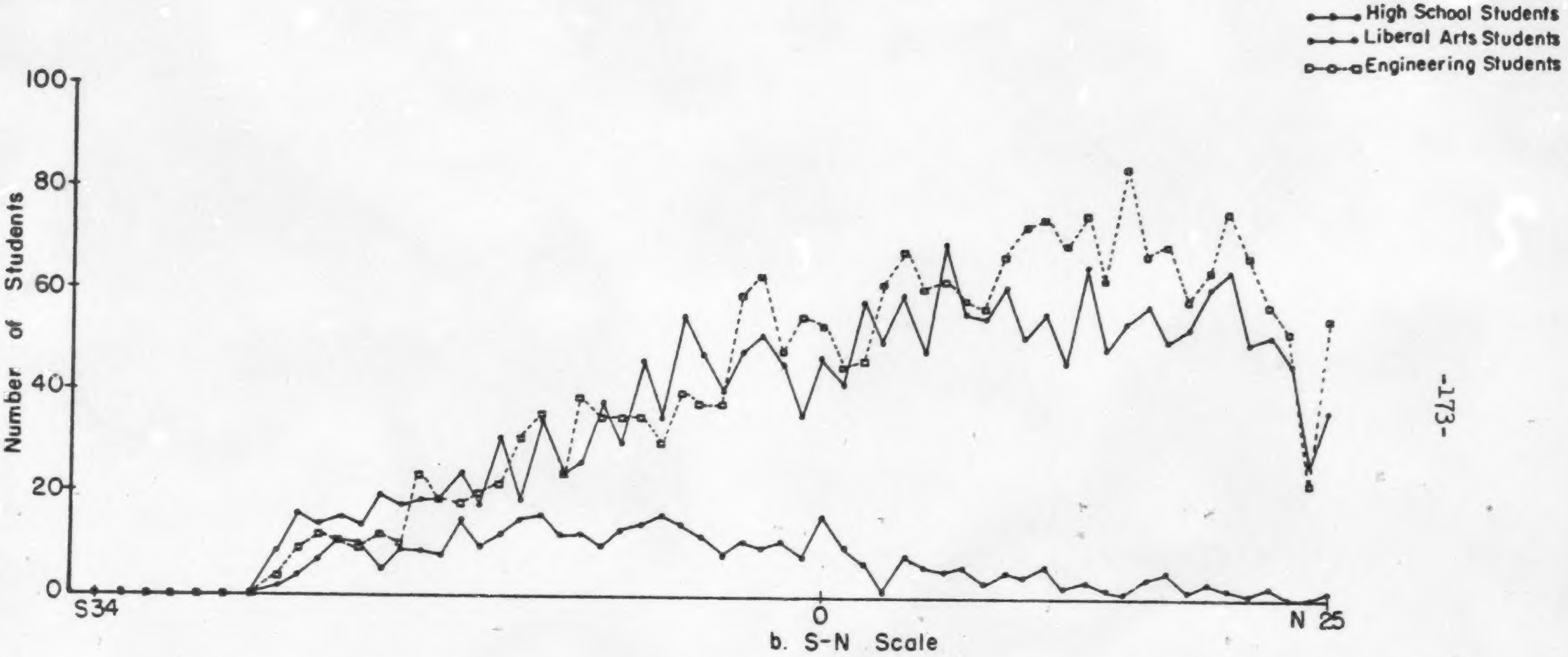

High School Students
Liberal Arts Students
Engineering Students
100
80
60
40
20
0
Number of Students
S34
0
N 25
b. S-N Scale

Fig. 1. contd

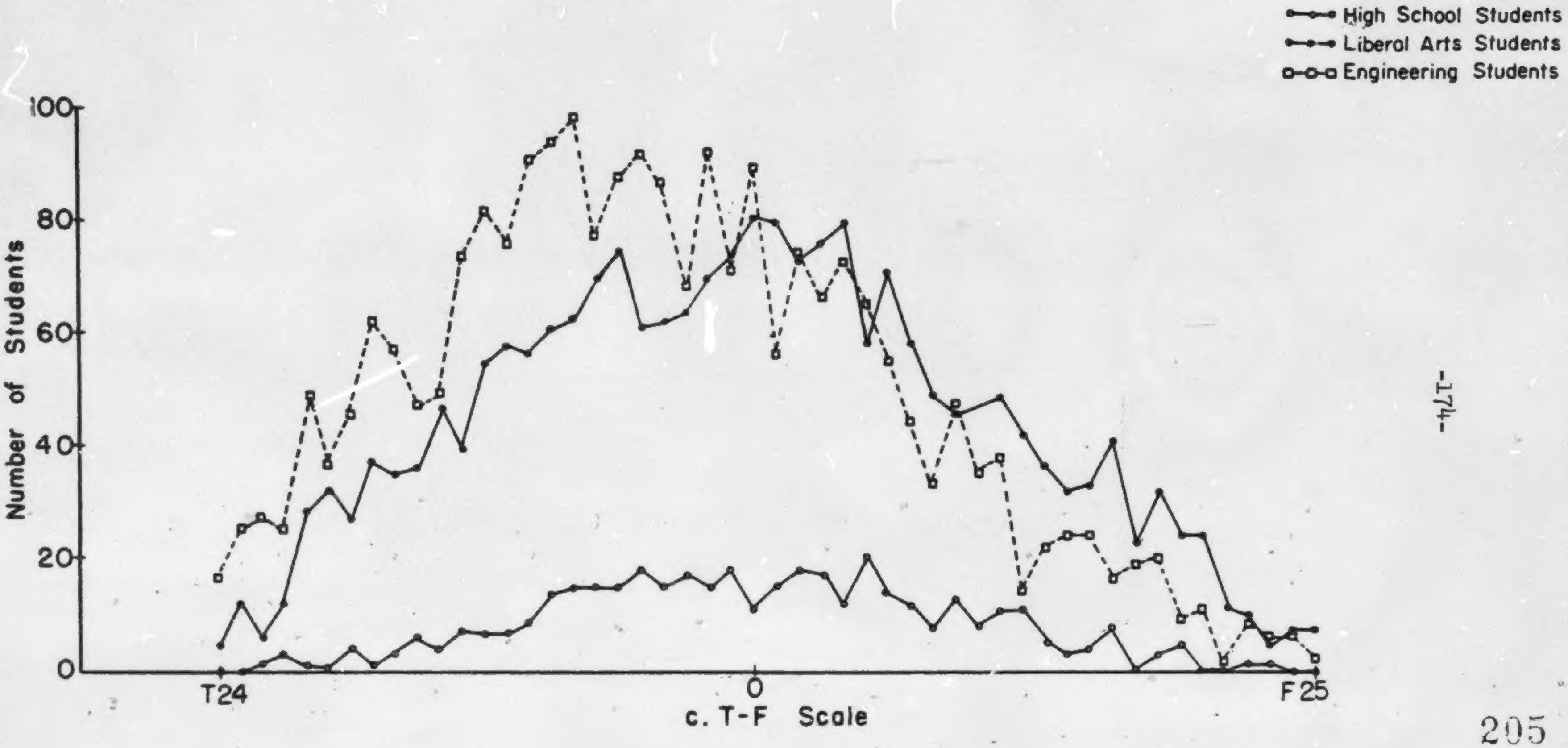

High School Students
Liberal Arts Students
Engineering Students
Number of Students
100
80
60
40
20
0
T24
0
F25
c. T-F Scale

Fig. 1. contd

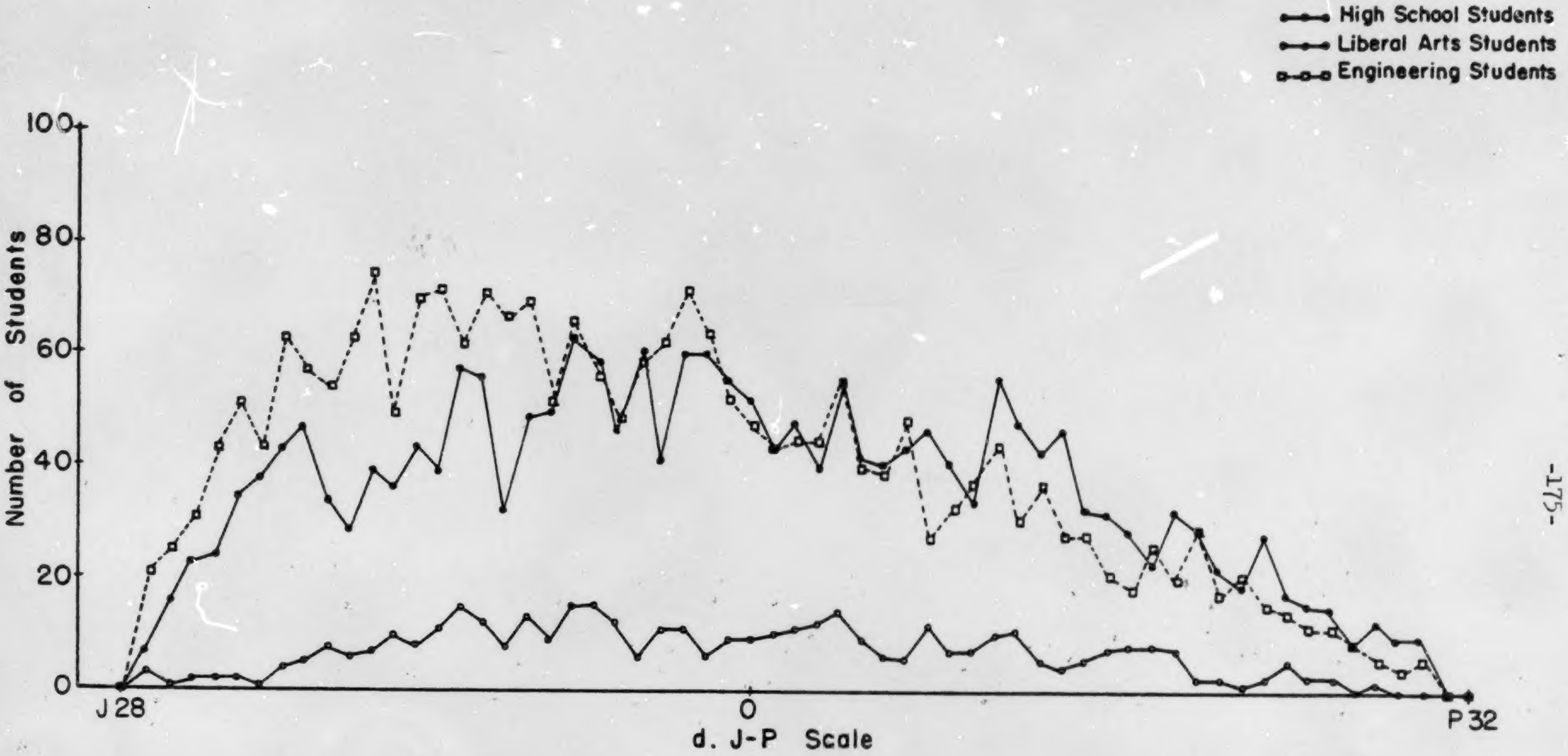
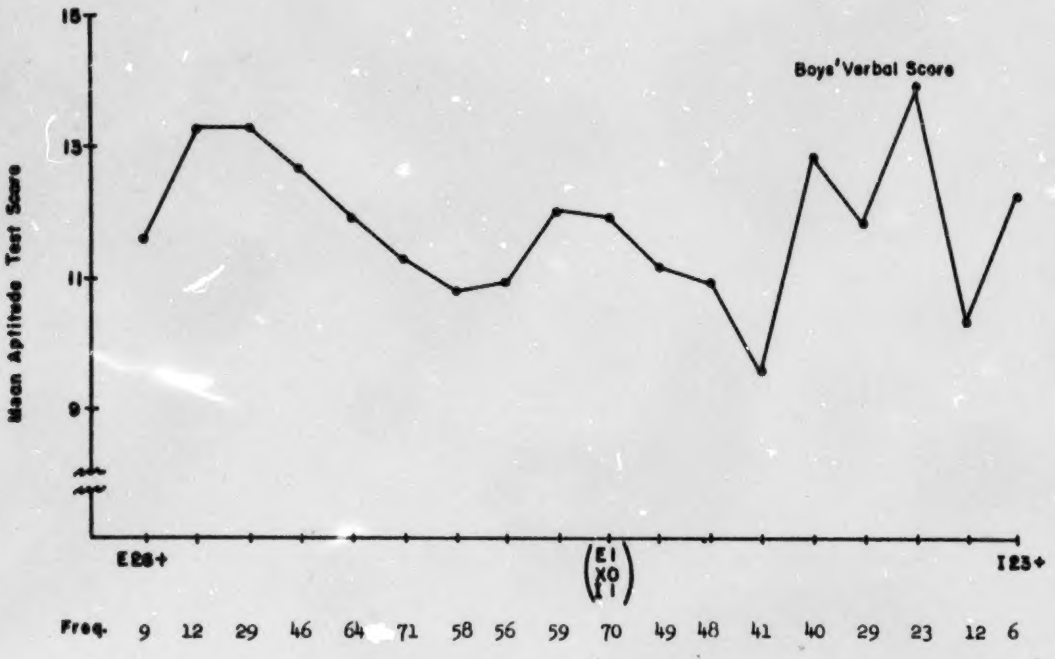


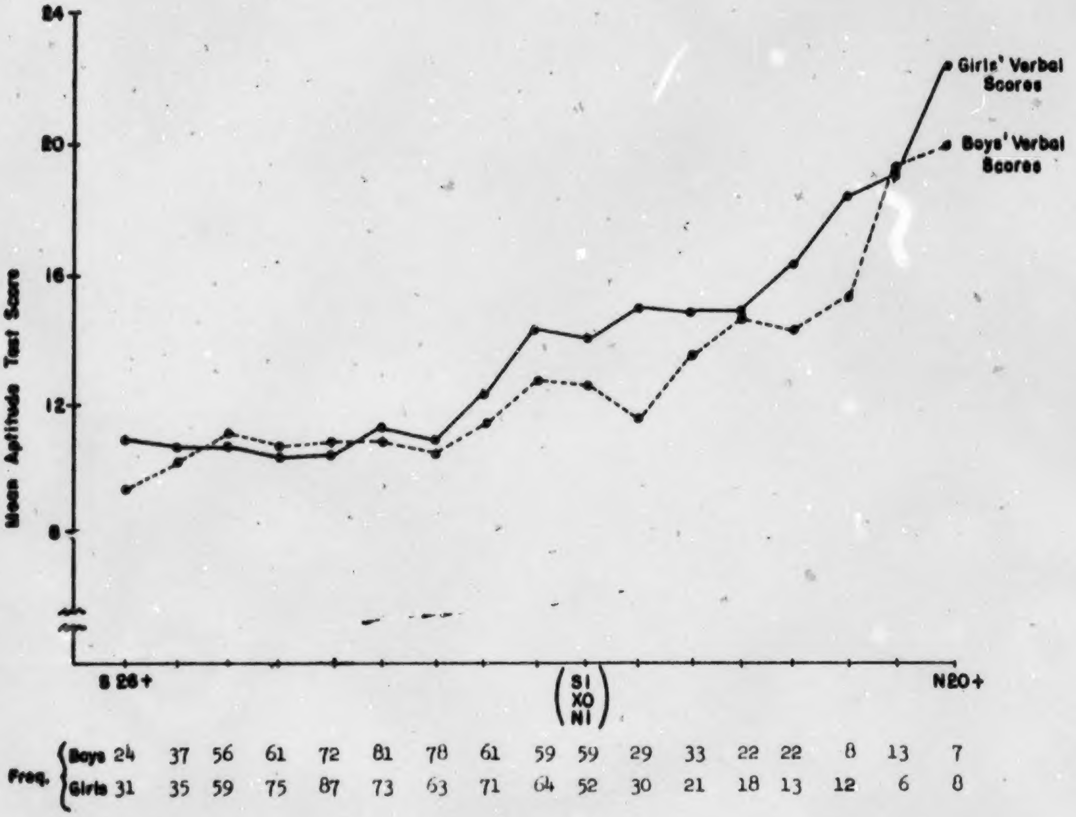
Fig. 1. contd

206

207

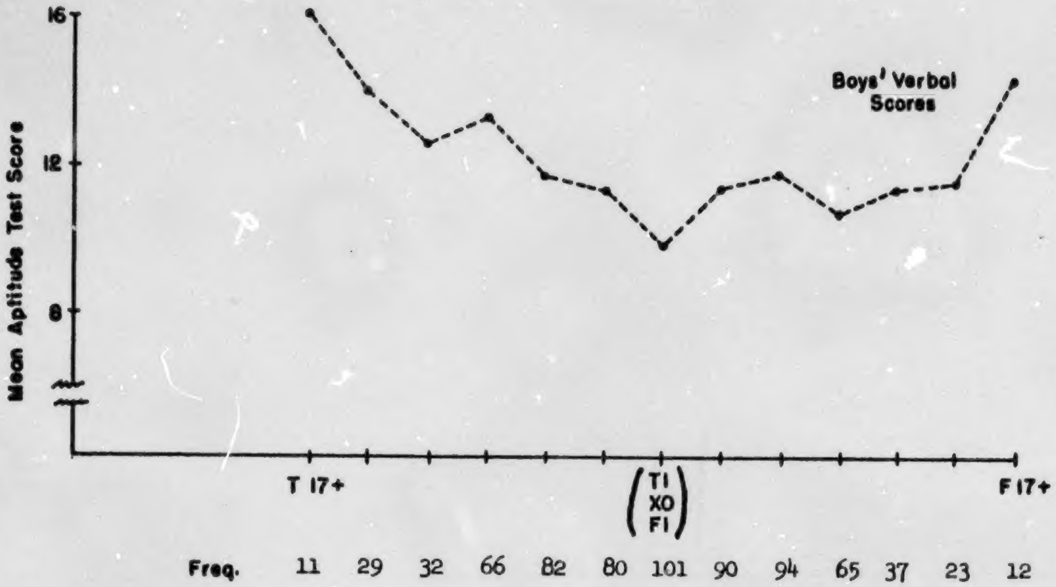


a. E-I Scale

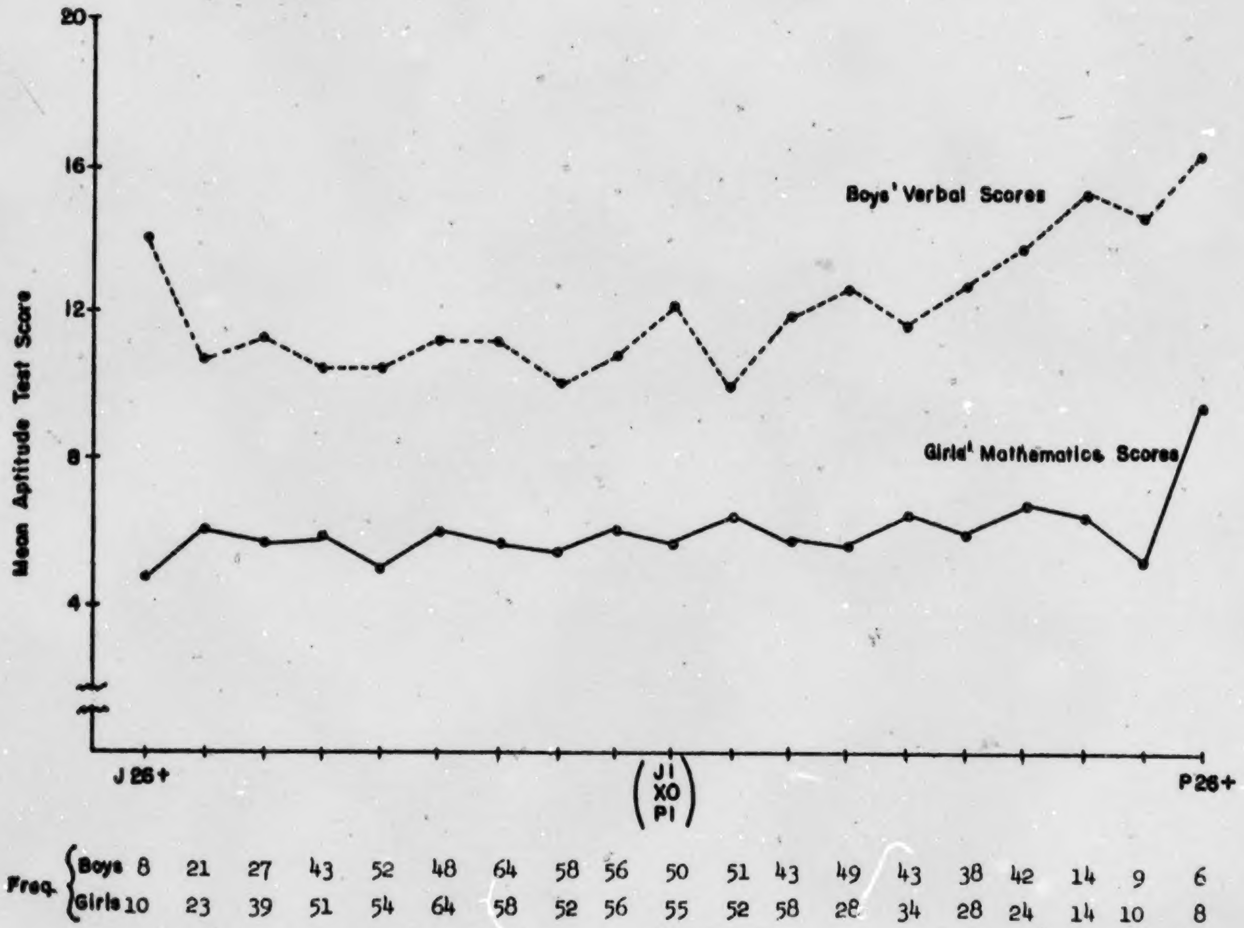


b. S-N Scale

Fig. 2. Regression of Aptitude Tests on Indicator Scores for High School Students

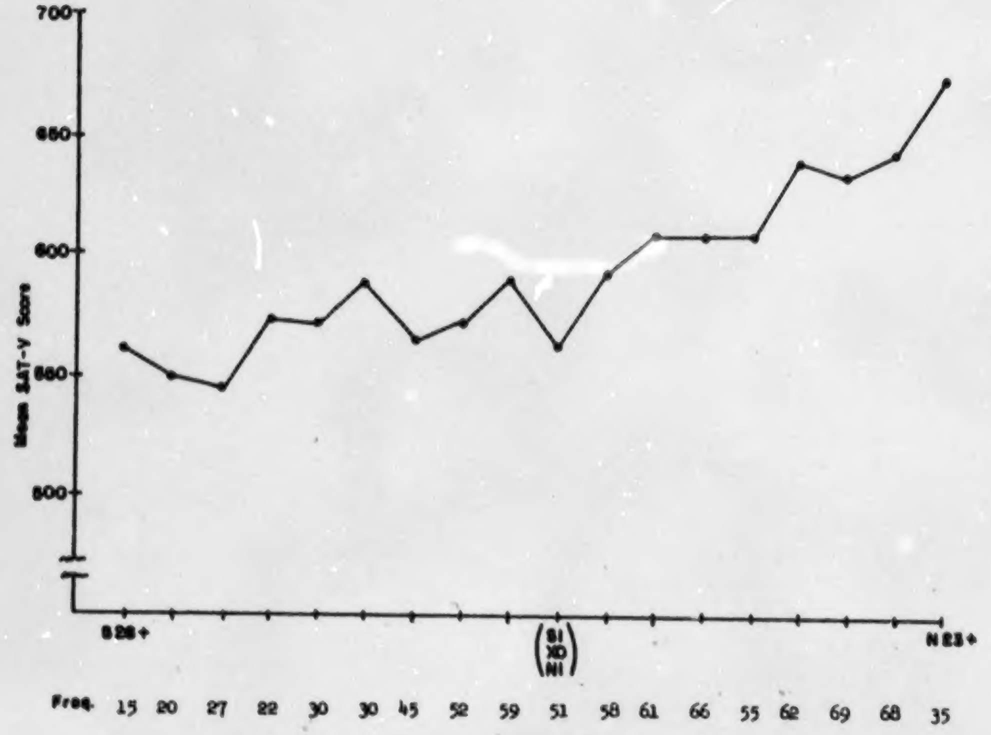


c. T-F Scale

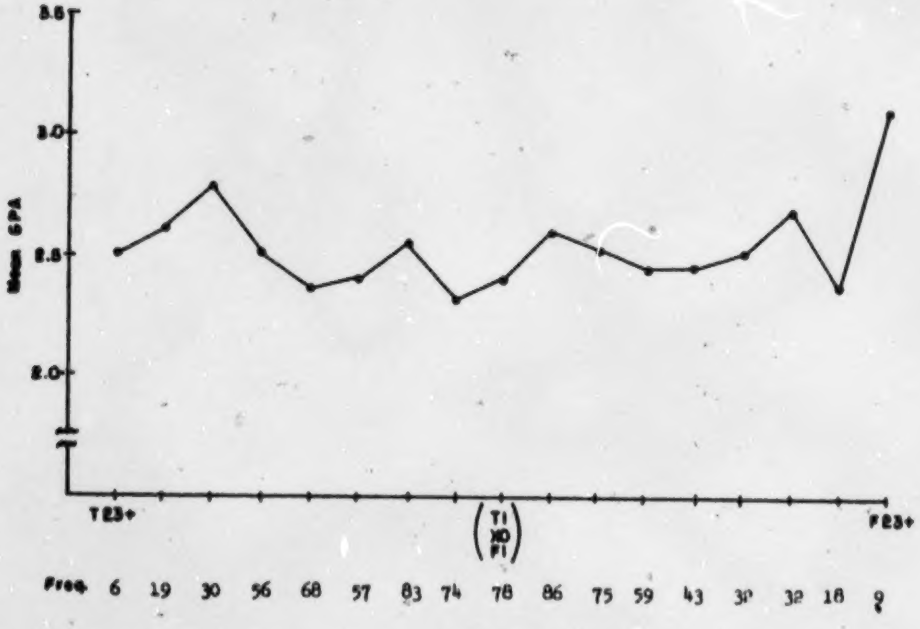


d. J-P Scale

Fig. 2. contd

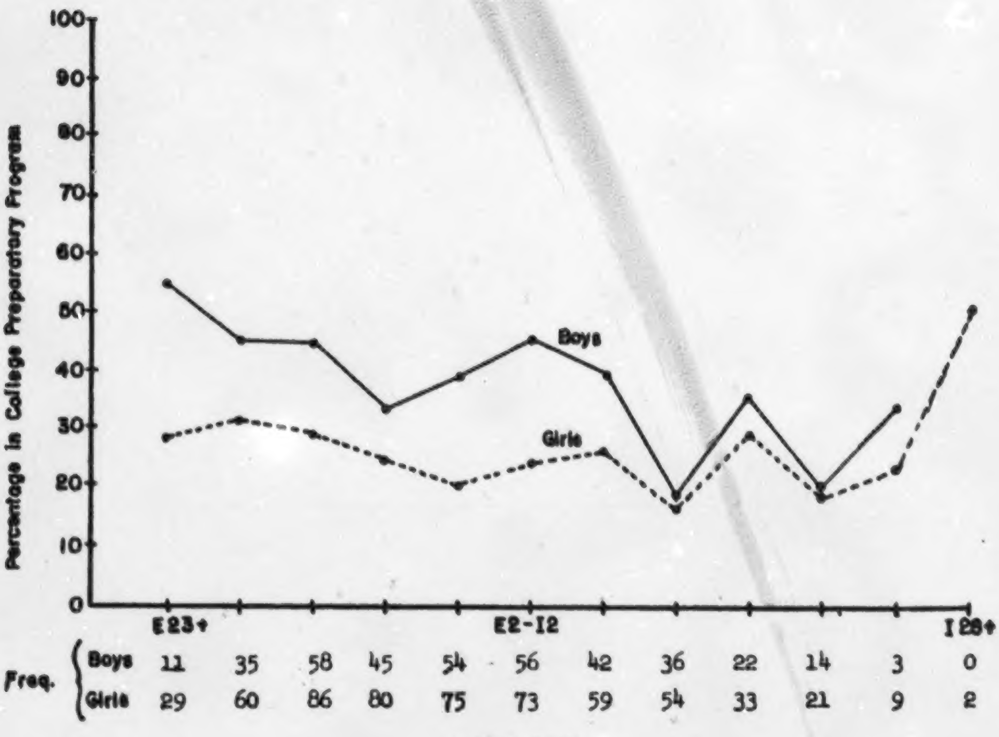


a. S-N Scale

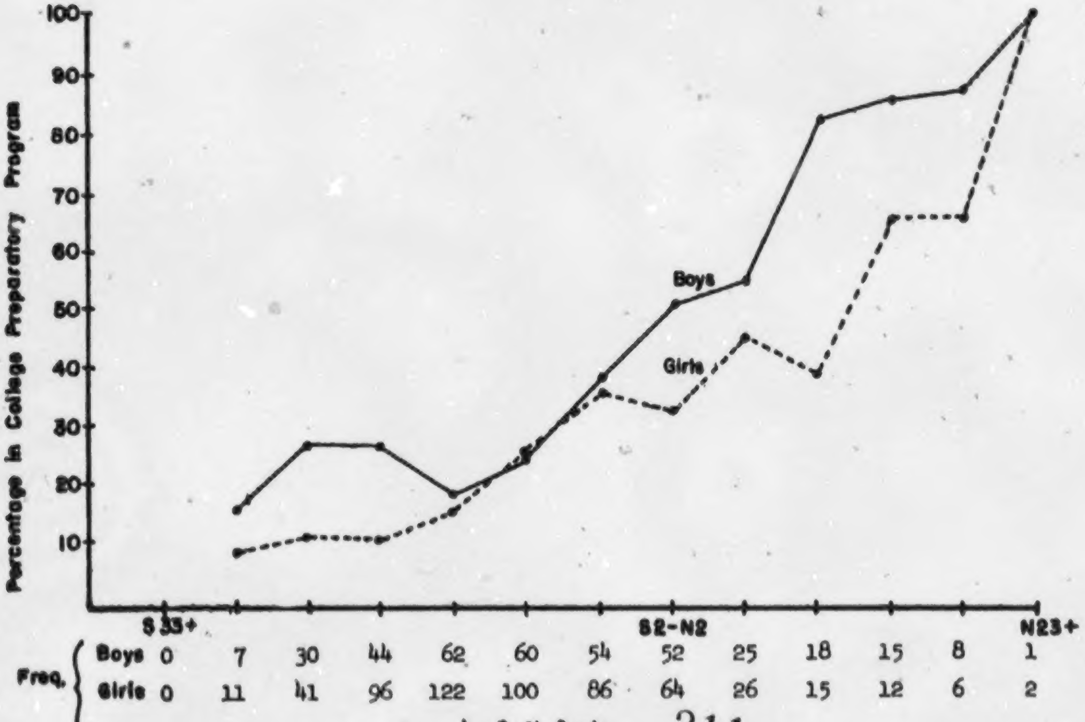


b. T-F Scale

Fig. 3. Regression of Aptitude Tests on Indicator Scores for Male Stanford University Students

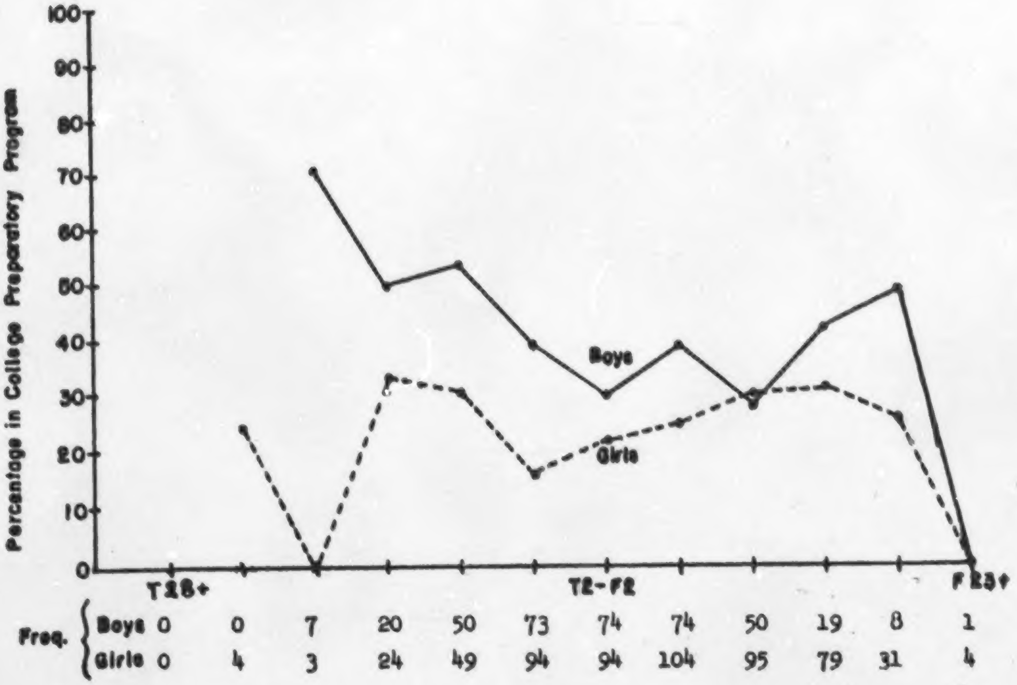


a. E-I Scale

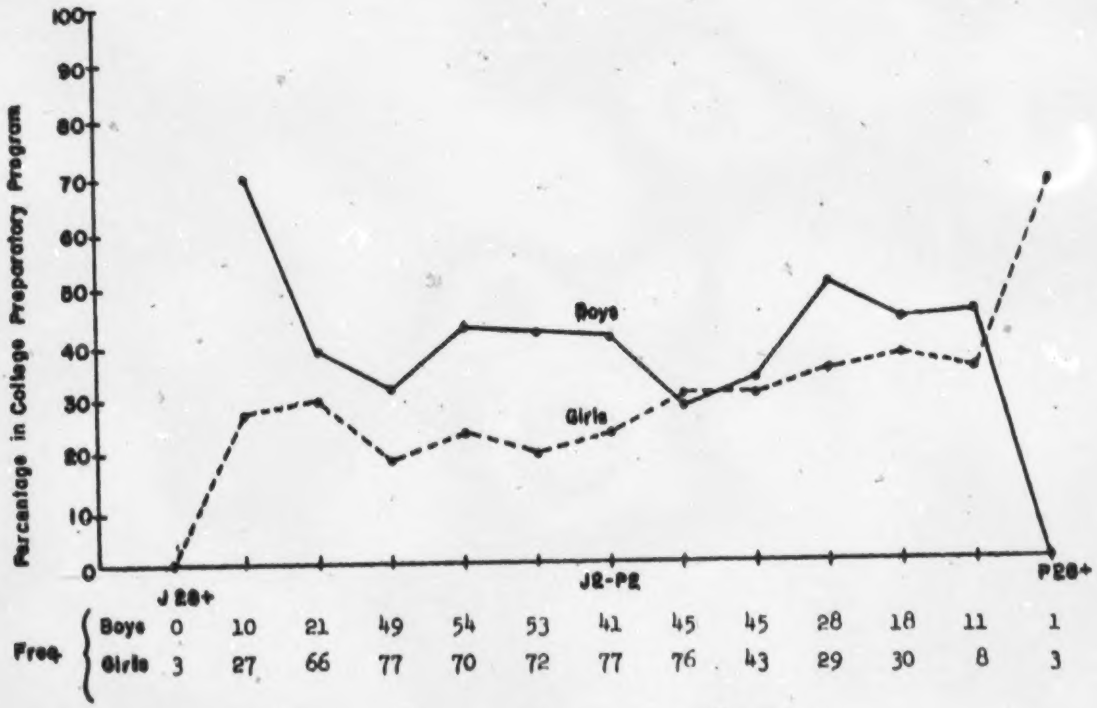


b. S-N Scale

Fig. 4. Relationship of Percentage of High School Students in College Preparatory Program to Indicator Scores



c. T-F Scale



d. J-P Scale

Fig. 4. contd